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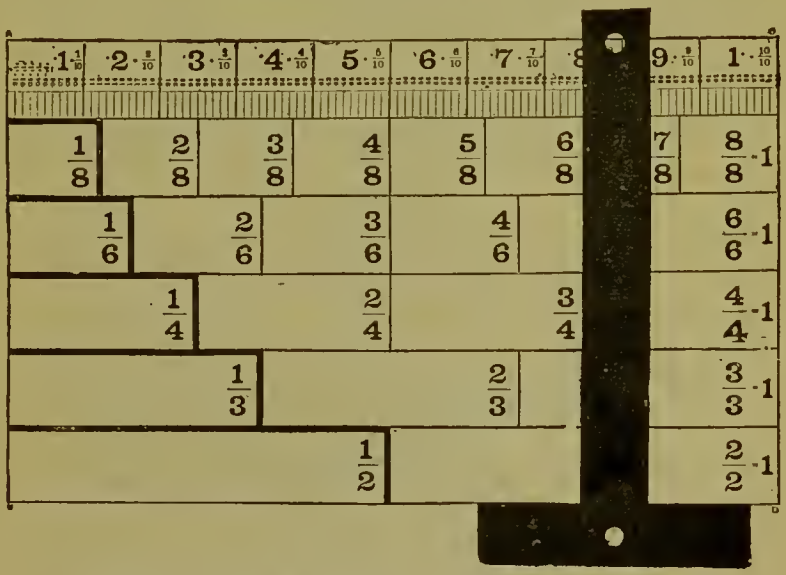

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BY

JOSEPH H. COWHAM, F.G.S.,

Master of Method: Westminster Training College.
Author of 'Graphic Lessons in Physical and Astronomical Geography.'

THIRD EDITION.

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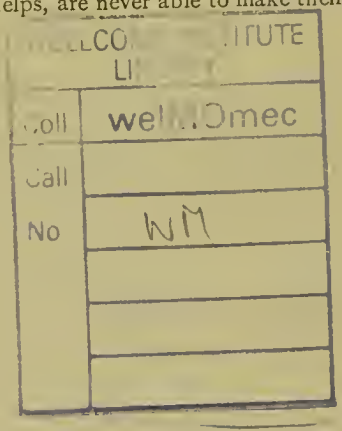
1892.

'I consider a human soul without education like marble in the quarry, which shows none of its inherent beauties until the skill of the polisher fetches out the colours, makes the surface shine, and discovers every ornamental cloud, spot, and vein that runs through the body of it. Education, after the same manner, when it works upon a noble mind, draws out to view every latent virtue and perfection, which, without such helps, are never able to make their appearance.'—*Addison.*



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PREFACE.

THE following chapters have been written after ten years' work in the preparation of the students of the Westminster Training College for their yearly examination in Teaching and School Management.

Constant appeal to the most familiar methods of school teaching forms a special feature of the work, and experience has proved the value of this mode of assisting young teachers who are feeling their way to a knowledge of the principles upon which their methods of instruction are based.

The matter is designed to meet the requirements of those who are preparing for the 1st and 2nd years' Certificate Examination; at the same time, the chief aim of the writer has been to bring a knowledge of the principles of teaching, together with the truths of science upon which they are based, within the intelligence of the youngest teacher.

The evidence of many old pupils now engaged in successful school work encourages the hope that the principles of teaching herein illustrated may prove of service to teachers generally.

The issue of a Third Edition (1892) has given the opportunity of revising the text and of making several additions. A chapter on the 'Place of Language in Teaching and Mental Training' will be found on pp. 208—216.

J. H. COWHAM.

WESTMINSTER TRAINING COLLEGE, S.W.

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TEACHING AND MENTAL TRAINING.

1. Introduction.

The exercise and development of the mind should be the chief aim of all oral instruction. Vast stores of information may be acquired from books and from observation of surrounding objects and of passing events, but none of these modes of gaining knowledge is, by itself, comparable for mental effects to such actual intercommunication of ideas between teacher and pupil as is possible in the exercise of oral teaching.

> The vitalising force which mind exercises upon mind is becoming more and more recognised in our teaching processes. Learning by books is no doubt of great value, and where no living teacher is available, is a necessary means of acquisition; it is, however, an acknowledged truth, that for high intellectual attainment, the main requisite is living contact with a teacher.

In order that the teacher may use to the best advantage the opportunities which his oral lessons afford for the purposes of mental training, it is necessary that, from the first, he should have an elementary knowledge of the growth and development of the mind which he undertakes to train. This subject is confessedly a difficult one to present in a scientific and yet intelligible form to the youthful teacher, and if the present attempt is somewhat unscientific in its treatment, it is hoped that what it loses in this respect it will more than gain in being intelligible to those who have not had the advantage of a previous course in mental science.

2. How mind manifests itself.

When an apple, or some other attractive object, is held in front of a young child it immediately shows signs of delight; its feet begin to dance; its face beams with smiles, and its hands stretch out to grasp the desired object. If now the entire series of these childlike and well-known operations be examined, they will be found to illustrate, in a very

elementary form, the threefold grouping into which all mental operations may be arranged.

1. There is the recognition, on the part of the child, of an object present to sight; it may be there is further a distinct recollection of a similar object seen a few hours or a few days before. This recognition and this recollection illustrate the class of mental operations grouped under the term '**Intellect**' or '**Knowing.**'

2. There are the manifestations of delight, aroused possibly by the colour of the object, and it may be there is desire awakened by the recollection of its taste. These manifestations (dancing of feet, smiling, &c.) are connected with, and are the outward symbols of, mental states which are classed under the terms '**Feeling**' or '**Emotion.**'

3. Lastly there is action, the result of awakened intelligence and aroused feeling. The hand stretched out to take the apple is the outward expression of a mental resolve. This action on the part of the child may be taken as an example of the third form of mental operation. It represents that group of mental manifestations termed '**Willing**' or '**Volition.**'

'Mental Science,' says Professor Sully, 'adopts this threefold division. (1) Under *Feeling* we include all pleasurable and painful conditions of mind. These may be very simple feelings, having definite bodily causes, such as the painful sensations of hunger and thirst, or the pleasures of the palate. Or they may be of a more complex nature, such as love or remorse. (2) *Knowing*, again, includes all operations which are directly involved in gaining knowledge, as, for example, observing what is present to the senses, recalling the past, and reasoning. (3) Finally, *Willing* or *Acting* covers all active mental operations, all our conscious doings, such as walking, speaking, attending to things, together with efforts to do things, active impulses and resolutions. The perfect type of action is doing something for an end or purpose; and this is what we ordinarily mean by a voluntary action.'

3. The threefold division of mental operations illustrated by a common school exercise.

A further example of the exercise of **Intellect, Feeling,** and **Will,** may be taken from a lesson to pupils nine years of age who are being taught, in a southern town, the geography of England. We suppose the class to be taking the physical

aspects of Yorkshire, and the special feature under discussion to be Flamborough Head. The teacher most probably adopts the following method :—

1. He exhibits a model of the county of Yorkshire and draws especial attention to the relation which the promontory bears to the bay on the south and the smaller headland on the north. Another connection which he is careful to make, is that of the promontory on the coast with the ridge of wolds or chalk hills which runs across the adjoining land.

2. By statement the teacher strives to bring to the minds of his pupils a visit to the seaside. Perhaps they have been to Margate, and know the N. Foreland. If not, they may be acquainted with some steep hill-side near home. Upon this knowledge he bases his description of the appearance of the new headland.

3. A specimen of the rock composing the promontory is exhibited, and passed to the class for inspection.

4. The name of the headland is placed on the outline sketch map, which is being filled in as each new feature is taught.

By such methods as these (to which should be added a power of graphic statement on the teacher's part, and a ready response to questions on the part of his pupils) an acquaintance with Flamborough Head is gained, sufficiently complete for general geographical knowledge.

In the familiar school exercise stated above there has been mental effort aroused and directed; there has also been a mental result achieved. Our purpose just now, however, is to distinguish the various forms of mental effort which have been aroused and to group these under the three heads of Intellect, Feeling and Will.

i. **Intellect.**—There have been no less than three forms of intellectual exercise clearly manifested in the lesson. *Observation* has been busy upon model, map, and rock specimen. *Memory* has been active in recalling the appearance of the cliffs seen at Margate some months ago, and the shape of the hill-side seen during the walk to school. There has been further the training of memory in the association of promontory with hilly ridge and the low sweeping bay. Lastly, the *Imagination* has been occupied in bringing together the material supplied by Observation and Memory, and in elaborating out of these a totally new image, viz., that of the shape, size, and surroundings of Flamborough Head.

ii. **Feeling.**—If all the appliances which the teacher introduced during the lesson were simply placed before the class, something would be learned by the mere inspection of them by the scholars. They would not however remain silent spectators long. Unless the teacher begin immediately to use his appliances, he finds himself plied with questions from all parts of the class. Now, what do these questions indicate? They reveal a state of unrest on the part of the learner, an inward prompting to enquire, and 'a desire to know.' And further, as gradually under the teacher's direction a complete and clear image of the distant headland is being developed, it becomes a new picture in the pupils' minds, and like other new pictures and scenes it arouses a distinct feeling of interest and satisfaction. Thus we trace at the beginning of the mental effort 'a desire to know,' and at the end of it a feeling of interest in the new image which has been constructed, and of satisfaction with the fresh knowledge which has been acquired. Now, whether the condition of mind be that of 'a desire to know' or an interest in what is known, the mental state is one of '**Feeling.**'

iii. **Will.**—Is there action? Yes; it is distinctly seen in the endeavour of the class to see all the teacher has to show; in the concentration of attention upon all he has to say, and in the effort put forth to understand all he wishes to teach.

CO-OPERATION OF INTELLECT, FEELING AND WILL.

The three operations of mind illustrated above co-operate during nearly every mental effort, but not always in the same proportion.

Example 1.

A young child is directed to observe a ball taken from Froebel's 1st Gift. The ball is a coloured one. At once the child is attracted by the colour, and, so long as this *feeling* of interest lasts, *will*, in the form of attention, is secured, and the teacher seizes this favourable moment to

direct the pupil's *observation* (intellect) to the shape and other qualities of the ball. It is clear, in this example, that the effort of will, so far as the child is concerned, is very limited in amount. A considerable force of feeling, however, is aroused, and at this stage of training is a necessary stimulus to will; and both conditions, viz., those of feeling and will, are necessary for the attainment of intellectual results.

Example 2.

A youth is engaged in committing to memory a stanza of poetry. A certain amount of pleasurable feeling is aroused the first time he realises the beautiful grouping of ideas which the lines suggest. This feeling, however, soon subsides with the reiteration of the words necessary to 'learning by heart,' and now the necessity of acquisition and the imperious demands of the teacher supply a sufficient stimulus to the scholar to set himself to the task over and over again. Feeling is now at a discount, whilst will becomes the predominant factor, effecting by repeated effort the required intellectual results.

The conditions of mental activity, illustrated by the two examples cited above, fairly set out those which rule the earlier and later school exercises respectively. The younger the child, the less is the power of will, and therefore, the greater must be the inducements to effort brought to bear on the child's mind from without, such as, for example, novelty in the object, and stimulus to effort on the part of the teacher. On the other hand, as power of the will increases, subjects of a less attractive kind may be attempted, and the scholar may be left to himself for independent work, and so be gradually prepared for effort when school days are over and when he must necessarily be left largely to his own resources.

The relationships existing between the three forms of mental activity are briefly stated in the following quotation: 'Most of our feelings,' says Prof. Sully, 'are wrapped up with or embodied in intellectual states (perceiving, remembering, &c.). Again, intellectual operations—observing, thinking, &c., are commonly accompanied by some shade of agreeable or disagreeable feeling, and they always involve voluntary activity (Will) in the shape of attention or concentration of mind. Finally, Willing depends on Feeling for its motive or impelling force, and on Knowledge for its illumination or guidance.'

ii.—INTELLECTUAL TRAINING.

In the last chapter we have seen that mental activities may be grouped under the three heads of Intellect, Feeling, and Will; we have further seen that any mental exercise which we undertake ourselves, or which by our teaching we may stimulate in others, manifests all three forms of effort, only in some exercises the intellect is the most active, in others feeling, and in others the will predominates. In school work generally, and in oral teaching particularly, the *Intellect*, *i.e.*, the power of perceiving, remembering, conceiving, and reasoning, is that branch of mental activity which we set ourselves most diligently to exercise and train, not forgetting the vast importance, and, indeed, the necessity, of exciting interest (*Feeling*) and of rousing the energies (*Will*) of the learner in all school work.

Introductory outline sketch of the most important exercises of Intellect.

We cannot proceed far in even the earlier forms of oral teaching without becoming experimentally aware of the different forms of intellectual effort which our pupils manifest. If, for example, an object like an apple is presented to their view, at once the youngest children are able to state something about its size, shape, colour, &c. These items of knowledge are clearly gained directly through the medium of the senses. Knowledge thus gained is sometimes termed 'sense knowledge,' and the entire intellectual act is termed **Perception.**

If asked the following day, the pupils will readily bring again under review the chief features of the apple; now, however, no object is present, but a mental image takes its place. The effort of recalling the features of an object not present to one or more of the senses is that of **Memory.**

If now the scholars recall the image of the apple seen yesterday, and by a mental effort transform that image as to colour and size in order to form a notion of some unknown fruit —a melon, for instance—an additional intellectual effort is introduced. This effort of transforming the images which memory presents is termed **Imagination.**

After a large mass of particular knowledge has been collected through the operations of Perception, Memory, and Imagination, the intellect becomes occupied in comparing and classifying its knowledge, and in this way general notions (concepts) are formed. From these the intellect proceeds to the higher operations of reasoning.

There are thus seen to be the following well-marked intellectual activities, viz., Perception, Memory, Imagination, Conception, and Reasoning. We may have been accustomed to hear these terms used in common discourse, and often in a loose fashion ; in this chapter our aim will be to utilise as far as possible the ordinary experience of the school in illustration of their more definite and scientific use, and at the same time to indicate as far as possible the conditions of school work most favourable for their development.

THE GAINING OF KNOWLEDGE THROUGH THE SENSES.

1. **Sensation.**—It will be necessary to take the period of infant life prior to that of school work for examples of that earliest and simplest form of intellectual activity termed *sensation*. A child only a few days old exhibits signs of recognising the change which it feels when a light is brought into the room—its eyes move, its hands and feet also respond. The child does not, however, for some days appear to be able to fix its eyes upon the light, and to follow it when moved about the room. The child is simply cognisant of a change from the dark to the light, and does not as yet connect the change which it recognises with any change in its surroundings, *i.e.*, with the introduction of the candle. **This condition of being able simply to recognise a change of feeling is the beginning of intellectual life. These earliest forms of intelligence are termed Sensations.**

2. **Perception.**—The child soon advances in its intellectual life from the condition of simply recognising a change in feeling, to that of associating the change with what produces it, *e.g.*, when a lamp is brought into the room the child

not only manifests a feeling of pleasure at the light, but in time its eyes become fixed on the light source; they also readily follow it, as it is moved about the room. This association of the mental impression (sensation) with the external object is an effort of the mind, and of the mind alone, for there was the reception of the mental impression in the early stage of intelligence, but nothing further; now, with the same external object and the same sense organ and impression, there is an increased mental effect, viz., that of the power of connecting the impression with an object. **This ability to connect the impressions of sense with an external object is termed Perception.**

The relationship existing between sensation and perception is clearly set forth by the author previously quoted. He says—'Sense impressions are the alphabet by which we spell out the objects presented to us. In order to grasp or apprehend these objects, these letters must be put together after the manner of words. Thus, the apprehension of an apple by the eye involves the putting together of various sensations of sight, touch, and taste. This is the mind's own work, and is known as Perception. And the result of this activity, *i.e.*, the distinct apprehension of some object, is called a Percept. **Perception is mental activity employed about sense-impressions with a view to knowledge.**'

3. **The senses.** Before proceeding to examine and arrange the knowledge which we receive through the medium of our senses, it may be well briefly to enumerate and classify the organs of sense. It forms no part of this course to enquire into the physiological structure of each of the sense organs; suffice it to say that each has a special structure admirably fitting it for the reception of its own definite set of impressions from some external source, *e.g.*,

i. **The eye** to be acted upon by vibrations of the luminiferous ether.

ii. **The ear** to be affected by vibrations of the air.

iii. **The touch** to be sensitive to actual contact with the surfaces of bodies.

We usually speak of having five senses, viz., sight, hearing, touch, taste and smell. Of these the first three are the most im-

portant avenues of knowledge, and are hence termed the 'intellectual senses.' Taste and smell minister considerably to our bodily necessities and enjoyments, but the elements of knowledge which they supply are neither many nor important.

To the senses already enumerated a sixth is generally added, viz., the 'muscular sense.' This additional sense is classed amongst the intellectual group because of the exact and full information it supplies us concerning many of the physical properties of external objects.

We use the term '**Sensitive**' with a variety of meanings. The Thermometer, *e.g.*, is an instrument which is sensitive to the slightest change of temperature. When a sense organ, the eye, *e.g.*, is in any way injured, and the admission of light causes discomfort, the eye is said to be in a sensitive state. There is a moral meaning sometimes attached to the term, *e.g.*, when any one is affected by the slightest change in the action or opinion of others, he is said to be of a very sensitive nature. The word '**Sense**' in its ordinary meaning is applied to action or opinion based upon complete knowledge and sound judgment, the result of wide experience.

THE EXERCISE AND TRAINING OF THE SENSE OF SIGHT.

1. **In the Infant School.**—Examples of lessons designed to develop the sight sense of pupils in the Infant School are sought best in the various employments and games of the Kindergarten. The six gifts of Frœbel present objects to children for direct inspection by the sense of sight.

In Gift I. the outline of the *sphere*—a circle in whatever aspect it is viewed—is noted by sight, and the eye is furthermore exercised in distinguishing the different colours of the six balls, and finally, in order to test the power of sight in determining colour, a piece of thread of the same colour as the ball is to be attached to each.

After dealing with the ball—its shape, colour, &c.—the *cube* is introduced in Gift II., and the eye is exercised in contrasting this new form with that of the sphere; the cylinder, meanwhile, combining some of the appearances of both sphere and cube. The cube is seen to be capable of presenting many different aspects to the eye, according to the way in which it is suspended. The effect of foreshortening is the special difficulty at this stage, and although very little is

attempted in the way of teaching this advanced branch of sight knowledge, it cannot but be beneficial that children be accustomed to see and recognise the cube in various positions.

Following these earlier Gifts are others, in which various rectilineal figures, such as oblongs, triangular prisms, &c., are presented for inspection. Sight exercise and training are now afforded by the multitude of object forms and symmetrical figures which are gradually introduced to the notice of the children, and constructed by them out of the material these higher gifts provide.

The operations of stick laying, the exact division and fold of paper required in paper folding, the beautifully regular designs produced in mat plaiting, and especially the exercise of modelling—all these require the close application of the sight sense, and when the lessons are arranged in a carefully graduated series, the exercises result in sight development and training.

The above Infant School exercises are only a few of those which are capable of affording definite and systematic eye-training. The series of *object lessons* which now forms an essential feature in Infant School work yields valuable opportunities for the training of the sight sense. The name of these lessons suggests the presentation of material for inspection by the class during every lesson, and that, not of the common features and qualities merely, but of those less obvious though very often distinguishing features, which, without direction, would be likely to escape the child's observation. In this way the habit of looking for less prominent details may be fostered in young children. It is not the ability to see what others cannot fail to detect that makes a valued observer; it is rather being able to see more than others, and to detect subtle distinctions which others just fail to notice, that will make the future successful experimenter in science and the highly skilled draughtsman in the factory. In these lessons, moreover, the children are encouraged to connect their sight impressions with oral statements, and thus the exercise becomes of still higher value.

One other condition of eye-training needs to be mentioned in connection with early school work, and that is, the association of drawing with the visual impression and the oral statement. **The eye to perceive, the hand to represent in graphic form, and the tongue to embody both in appropriate language; these yield a trio of operations of the highest value for both practical and educational ends.**

2. In Schools for Older Children.

In schools beyond the Infant stage there is considerable exercise for the eye, but with the exception of the drawing, writing, and science lessons the exercises are not designedly of service to the training of the sight sense. We shall perhaps best understand the value for training which the lessons in these schools yield the sense of sight, if we take each subject of school work in turn, and try to realise what are the exercises in sight which each lesson affords.

In the Reading Lesson the eye recognises the characters making up the words, and the words making up the sentences in the passages read. The sight is further engaged in looking considerably ahead of the voice in order to enable the reader to sum up the meaning of an entire sentence before beginning to express it in words. After a time the eye does this almost unconsciously, thus allowing nearly the entire thought of the reader to be concentrated in grasping the meaning of the author, and in regulating his voice in order to give expression to his meaning.

In the Writing Lesson sight is the primary sense engaged. The eye of the scholar closely examines the variety of forms which written characters present; the hand then becomes the servant of the eye, and attempts to reproduce the forms presented in the first case by sight. It is true that after a time the hand becomes so accustomed to the movement necessary for the production of manuscript letters that it appears to act almost independently of the eye. The latter organ, however, becomes the final judge, and decides whether the forms produced by the hand are correct or not.

In the Drawing Lesson the work of the eye both as director and judge is of paramount importance. In the writing exercise a considerable departure from standard forms is permitted, so that a fair imitation of the copy is allowed to pass muster. In drawing, however, the eye is occupied in estimating very carefully and exactly the lengths, breadths, and other proportions of the objects or copies to be represented. In writing, again, the letter forms are only fifty-two in number, including capitals, and these are being constantly repeated; but in drawing, the copy or object is constantly being changed, and the eye, with each exercise, is called into full effort.

In the Object Lesson the same valuable training of the sight sense should obtain in the school for older children as that stated under Object

Lessons in Infant Schools. In the **Arithmetic** Lesson the eye is occupied only with the forms of the ten figures, and their neat and orderly arrangement in sums. In **Geography**, the wall-map, map-drawing, and the examination of models and specimens of productions yield occupation for the sight sense.

When thus we summon under one view the entire range of school work above the infant stage, it is evident that only in three of the lessons named is there any place for eye exercise of a valuable kind. In the reading lessons and in those of grammar and history the effort of sight is almost automatic. **During the writing lesson, the drawing lesson, and during object teaching, however, there is work for the sight of a distinctly formative kind.**

It has been shown that considerable training of the sight sense is attempted in the infant school; when, however, we remember how very much we depend upon the knowledge which sight affords, and when further we realise how much the sense can be improved by judicious practice even after school-days are over, there is reason for the desire which is almost universally manifest, viz., **that at least drawing should be an essential in every school curriculum, and that added to this there might very well be some object teaching and some manual exercises demanding the continued effort of the sight sense in a distinctly formative way.***

THE EXERCISE AND TRAINING OF THE SENSE OF TOUCH.

The hand and especially the finger tips may be taken to represent this sense organ. It is true that other portions of the body are very sensitive to touch impressions, as, for example, the tongue and lips; it is also true that the entire surface of the body is capable of yielding these impressions, but for all purposes of school work the hand is the most important agent of this sense.

A. Examples of touch impressions:—

1. When the smoothly turned wooden ball of Gift II. is placed in a child's hand, contact is detected by the 'touch sense.'

* Since writing the above paragraph the subject of 'Drawing' has been made obligatory in all schools for boys, and 'Manual Instruction' has been placed on the school curriculum.

2. Again, the child's hand rests upon the surface of its paper or slate during the exercise of writing. The surface is felt by the sense organ of touch.

3. In these examples there is gained, over and beyond the simple impression of contact a knowledge of the size of the object, so far at least as the area covered by the hand is concerned. We know, for instance, whether the hand is resting on a surface of considerable extent, or on a narrow edge merely.

4. The hand is further capable of distinguishing the nature of the surface in contact with it, *e.g.*, whether smooth or rough. This power is due to the ability which the sense yields of determining (*a*) whether the hand is only in contact with a number of points on the surface of the object, in which case the object is *rough*, or (*b*) whether the hand is in continuous contact with the surface so that no points are distinguished, in which case the object is *smooth*.

5. When an object is placed upon the open hand resting on a desk or table the object is determined to be *light* or *heavy* by the pressure conveyed through the touch sense.

6. Finally, hot and cold surfaces are immediately recognised, and with greatest ease, by the sense of touch.

Thus notions of *simple contact*, of *size* for a limited extent, of *nature of surface*, and of *weight* and *temperature*, are gained through the medium of the sense of touch. These notions are greatly enlarged by the power we possess of moving the fingers, the hand, and the arms. In this way the size of an extended surface, such as the top of a table, is determined; and, by rapidly passing the hand over two or more surfaces, the slightest differences in size, smoothness, roughness, and temperature are recognised. **Passive touch** enables us to gain the first set of impressions; **active touch** the latter.

This power of movement by which a sense organ is vastly increased in efficiency is not confined to the sense of touch. The sense of sight is similarly endowed. So important are the notions which we receive by means of these muscular movements that these notions, together with the muscular effort which supplies the material for them, constitute a sixth sense termed the **muscular sense**.

B. The muscular sense.—Effort is a most valuable means of gaining knowledge, and there are good reasons why this should be so. First there is a general arousing of the vital forces, for something has to be done; secondly, the change which effort occasions is, for the most part, sufficiently apparent to be recognised, and hence utilised for the purposes of knowledge;

and finally, as the effort can be modified, so different degrees of result can be obtained and observed. When thus the sense organ is associated with the muscular movement which brings about the change of experience (as is the case with the senses both of touch and of sight), the slightest change is much more likely to be observed; besides, there is the feeling of expectancy aroused; the mind is on the alert; and now both the state of the bodily organ and the mental condition combine to secure a lasting and reliable result.

Examples of muscular sense impressions:—

1. **Weight.** We have seen that the weight of any body can be roughly determined by the amount of pressure which the body exerts upon the open hand. When however we wish to estimate more exactly the weight of any substance under inspection we lift the substance and poise it on the hand for a short time. The notion of weight in the latter case is gained by the amount of muscular effort required to lift the body, *i.e.*, by the **muscular sense.**

2. **Solid shape.** An infant grasps a ball in its two hands (Kindergarten Gift I.). In order to hold it, the fingers bend round the ball. Here again is muscular effort; if the surface were flat no such bending of the fingers would be possible; moreover, the more curved the surface the greater is the amount of bending, *i.e.*, of effort. **In this expenditure of effort by the muscles of the hands, the child gets its first notions of solidity.**

   It is true that at the time that the fingers are grasping the ball the child's eyes are busy taking in the distribution of light and shade on the surface of the ball. After many objects have been examined in the hand and the light and shade have been completely associated with the solid surface, the child is able to determine whether an object is solid or not by sight alone. When this occurs, the child sees the distribution of shade on the surface of the object and mentally interprets these appearances; thus showing that it is not entirely what the senses present to us that establishes what we know of external objects, **there is also the very important factor of mind, and the use it makes of the material which the senses enable us to collect.**

3. **Size.**—The size of an object is estimated by the amount of muscular energy expended in the following, amongst other ways: a tree trunk, by passing the arms round it; the surface of a table or of a desk, by passing the hand over it; the length of the school room, by walking across it.

4. **Hardness, softness, &c.**—Place an apple in the hands of a child, and ask whether it is hard or soft; the answer is obtained after the child has pressed it between the fingers. Children will readily enough, under these conditions, state not only that the object is soft or hard, but the degrees of the quality. Very slight distinctions of quality in two or more bodies are readily detected by the degrees of muscular effort expended.

Summary of notions gained by the sense of touch and the muscular sense.

A very useful exercise, sometimes seen in infant schools, is that of causing a child to close its eyes whilst an object, say a work-box, is placed before it. The child is then asked to tell all it can about the object, using only its hands in the exercise.

1. By placing its hand flat on the top the notions of *smoothness*, *flatness*, and of *size* (as far as the child's hand extends) are obtained by **passive touch**.
2. The child moves its hand horizontally from front to back, and from right to left; thus a notion of the *area* (*i.e.*, length and breadth) of the top is determined by the **muscular sense**.
3. When the hand reaches the edges of the box the fingers are seen to bend over them, and a surface at right angles to the first is thus noticed. One hand is now placed on the horizontal, and one on the vertical surface. These movements of the fingers and the hands enable the child to determine *solidity*, and after some practice, to tell the shape of the solid, whether a cube, a sphere, a cone, &c. These are gained by means of the **muscular sense**.
4. The object is finally determined to be *hard* and *heavy* also by the aid of the **muscular sense**.

The importance of the early exercise of the sense of touch and the muscular sense.

It has been shown that some of the important properties of bodies can only be gained, so far as observation is concerned, by submitting them to the sense of touch, *e.g.*, weight, hardness, &c.; it has further been shown that the impression of solid shape, which we credit the eye with seeing, rests, in the first place, upon touch impressions. From these considerations the importance of submitting objects to children to handle during the early years of training is very apparent. The material placed in their hands should be selected, also, so as to present the various qualities which the touch sense is capable of discerning, and, further, should as far as possible present these qualities in various degrees.

The Kindergarten Gifts and occupations present material of various shapes and textures. Thus the ball in Gift I. is soft, that in Gift II. is hard and smooth. The sphere in the same Gift contrasts in shape with the cube, whilst the cylinder forms the link between the two. The laths are elastic and hard, whilst the clay is soft and inelastic. The paper strips in mat plaiting are readily torn, and develop the notion of weakness, with the accompanying delicacy of handling in order to preserve their shape.

C. Training versus exercise of the sense of touch and the muscular sense.

The intellectual value of any series of sense impressions depends upon the readiness with which they lend themselves to comparative observations. The intellect is best exercised

when it is made to discriminate between degrees of the same kind of impression. If, for example, we take up the ball in Gift I., and teach that it is round in shape, soft to the touch, and light in weight, we have taught a number of distinct qualities, all of which are discerned by either the simple form of touch or the muscular sense; but whilst this mode of teaching results in our pupils gaining certain items of sense information, the exercise does not yield the highest form of sense training. If, instead of keeping to one ball, we take a number of them, and institute a comparison, say as to their weight, we may obtain the following exercises of the muscular sense, viz. :—

i. A wooden ball is compared with one of lead of the same size, and as a result one is found to be *heavy*, the other *light*.

ii. The wooden ball is now compared with one of stone. The latter is felt to be heavier than the wooden ball, but lighter than the one made of lead.

iii. A ball of cork is now introduced and compared with the wooden ball. The wooden ball which, in the previous stages of our lesson was found to be lighter than the stone and leaden balls, is now found to be heavier than the cork.

iv. Allow the class to arrange the four balls in the order of their weight—(1) Lead, (2) Stone, (3) Wood, (4) Cork.

Following the above type of lesson, others may be arranged upon the comparative smoothness and roughness of certain substances. The colours and shapes of a number of objects may form other lessons in comparison; these, however, belong to sight training rather than the training of either the touch or the muscular sense. From such simple cases as these the following condition of sense training may now be stated :—

The best results are not obtained when a miscellaneous group of the qualities of any single object is brought under the notice of a class. Training a sense, *i.e.*, developing its power of fine distinction, is best aided by a comparison of the degrees of a given quality as these manifest themselves in a variety of objects.

D. Value of the combined exercise of sight and touch.

In oral teaching whenever an object is held before a class the pupils immediately manifest a desire to take it into their hands and so to submit it to a double form of inspection.

In the Kindergarten exercises this desire on the part of the members of the class is satisfied by providing each pupil with specimens of the material forming the subject of the lesson. The value of this double form of inspection is indicated by the following considerations :—

1. When we look at an object its colour and, in part, its size are seen. The shape is inferred from the distribution of light and shade upon its surface. No knowledge of hardness, softness, elasticity and weight is conveyed by sight alone. Hence, when a child is told to look at a new substance, the notions it receives are limited. It very naturally desires to know more.

2. When the object is placed in the pupil's hand, in addition to the impressions of colour and size stated above, the notion of size is either confirmed or corrected by the ease or difficulty with which the object is grasped ; the solid shape which before was inferred from the sight impressions of light and shade distributed over the surface, is now directly determined by the impressions received through the muscular sense—bending the fingers round it if the object is small, if larger, grasping it in the two hands ; its weight is recognised roughly by the muscular effort required either to sustain or move it ; the qualities of hardness, elasticity and smoothness are also directly received through the muscular and touch senses ; and thus in a few seconds and mainly by the child's own power more knowledge of the object under discussion is gained than could be conveyed by a long lesson made up of oral statement by the teacher accompanied by mere sight impressions by the class.

3. In addition to this extension of knowledge, there is a finer power of sense discrimination induced by the double sense effort. Finally, the pupil, after continuing the combined effort of sight and touch in determining solid form, comes to trust almost entirely to sight impressions for his notions of solidity.

E. Why the sense impressions received by sight are so valuable.

i. *For knowledge :*—(*a*) Fine distinctions of light and shade and colour are capable of being conveyed directly by the

sight sense ; and this power of fine discrimination can be greatly developed by practice. (*b*) A variety of colour and shades of colouring can be observed, and their relative positions determined by the eye at the same instant. In this way the harmonious and pleasing effects of a landscape and a picture, and the grouping of colour in dress and in furniture, are appreciated by a trained observer. (*c*) The size of objects, after certain standards of height and length and breadth have been settled, is roughly determined by sight. Standards for measurement by sight may be made in the school by marking out the door-post into feet and inches, by placing a plan of the school with dimensions of length and breadth in a conspicuous position, and by painting a yard divided into feet and inches on the side of the blackboard. (*d*) The shape so far as area is concerned may be seen, but, as has been already stated, the solid shape is inferred from certain signs in the form of light and shade. (*e*) Similarly, distance is inferred, partly from the apparent size of the object, and partly from the distinctness of its outline. In practice, therefore, **colour, size, shape,** and **distance,** are all determined, either directly by means of the sense of sight, or by inferences based upon our sight impressions.

ii. *For training:*—It has already been stated that the intellectual value of any series of sense activities depends upon the readiness with which they lend themselves to comparative observation. The sight sense stands out in pre-eminent advantage here. Two or more objects in view at the same time are immediately compared as to size, shape, distance, and colour. There is no waiting in order to bring the objects into position for comparative inspection such as would be necessary if their relative hardnesses needed to be determined by the muscular sense. It is owing to the remarkable facility with which the sense of sight enables us to record and compare our impressions, that this sense has become almost the sole medium by which these impressions are sought to be conveyed, it being forgotten that those of some qualities cannot be conveyed by this sense.

VALUE OF THE SENSE OF HEARING.

The value of this sense in school work rests largely on the fact that in oral teaching, in conversation, and in reading aloud, both knowledge and thought are communicated from one person to another through the medium of sound. The power to express the subtleties of thought by means of voice expression indicates a refined ear for sound.

Musical sounds become a source of pure pleasure to those who can appreciate them. The continued practice of music tends to develop a high power of sound discrimination. The song is, further, of great value amid the other school exercises, on account of the complete change it affords from other and severer studies.

SCHOOL EXERCISES AND SENSE TRAINING.

We have now completed our brief review of those senses which, on account of their importance as means for conveying impressions, have been termed the intellectual senses. Some of the peculiar forms of information which each sense is specially adapted to transmit have been indicated, and we have moreover seen how some of these senses work in harmony with each other and produce an accumulative and very reliable result. Further, in our classification of these intellectual senses, the great importance of the sense of sight, both for knowledge and intellectual effect, has been indicated; it now remains for us to indicate as far as may be **(1) To what extent our school training should aim at developing the efficiency of each intellectual sense, and (2) the methods by which this development may be secured.**

A. To what extent our school training should aim at developing the efficiency of each sense.

The sense organs have been termed the gateways of knowledge; the absence of a sense means to the person so bereft, that those impressions which this sense alone can

transmit are entirely wanting, *i.e.*, the store of knowledge is diminished to the extent represented by these lost impressions. Children in schools are, however, for the most part in the entire possession of their senses; at the same time, no teacher can have failed to notice a considerable difference in the use children make of their senses as well as a difference in the results obtained by their use of them. It is further generally admitted that the senses can be developed, *i.e.*, their power of discrimination can be vastly increased, especially if the training of them be undertaken in early life, *i.e.*, whilst the physical organ is still developing. As an example of this, the case of a blind child and the wonderful development of its sense of feeling or touch may be quoted. The evidence of marksmen for sight sense, of trained musicians for hearing, as well as that of the blind for touch, appears conclusive of the truth that each sense is capable of great improvement in its power of transmitting finer and yet finer distinctions of impressions.

It should not be the aim of school instruction to cultivate one set of impressions exclusively. On the other hand the power of the intellect appears to have its limit, so that the entire range of the senses cannot at the same time be raised to the highest pitch of excellence. In order therefore that no one sense should have undue advantage, our curriculum of infant training ought to be so arranged that each of the senses may be exercised and developed according to its value for immediate information and for future service.

Moreover, in these early years, whilst the senses are with greatest advantage developed, the curriculum ought to be arranged so that the intellectual forces are not drawn off unduly in efforts which belong to a later period of school life. The division of the infant school curriculum into three parts, (*a*) object lessons, (*b*) varied occupations, and (*c*) elementary subjects, is well devised for a fair distribution of exercise, if about equal effort be allowed each group of subjects.

The answer to the question at the head of this section may now be stated as follows :—(1) Each sense ought to be systematically exercised, so that its ability to yield distinct

and reliable impressions may be increased. (2) That whilst we cultivate the sense of sight most of all, the remaining intellectual senses, viz., touch, and the muscular sense, and hearing, should have their share of exercise and training.

B. The Methods by which the development of the senses may be secured.—Training the senses.

1. Exercise which is not training.

A child in the home is presented with a great variety of toys ; it plays with these indiscriminately, taking up in turn any one that for the moment presents itself. The child is receiving exercise, it may be, for all its senses ; its eye is caught by the bright colour of one toy ; it takes another into its hand ; shape and weight in this case exercise both touch and the muscular sense ; another toy pleases the child by the ringing noise it yields when allowed to fall ; the child's senses are being exercised and information is being collected of a more or less valuable kind. At the same time there is not that systematic exercise which has for its aim the development of a finer and still finer power of distinction between different impressions ; there is exercise, it may be, of all the senses but the systematic training of none.

2. Exercise accompanied by Training.

In order to witness a lesson in which there is both exercise and training a visit must be made to some Kindergarten or infant school under enlightened teaching. Suppose the class to be composed of little children from three to four years of age, and the lesson an early one on 'colour,' the object illustrating the colour to be taught being an orange. The class is supposed to have had a previous lesson on the colours *white* and *black*. As an introduction to the present lesson I hold up first the white ball, and the children state in reply to my question '*The ball is white.*' Similarly with the black ball. A further step in revision is to ask for names of *white* things, and then for names of things which are *black*.

Now the class is prepared for the new stage. I hold the orange well in front of the class ; allow them to look at it carefully, and then ask the children to point to any object of the same colour as the orange. In answer to my request the children select various examples, such as the yellow ball in Gift I. ; an article of dress ; some child suggests the canary.

So far my lesson has dealt with 'things,' and at present the attention of the class is concentrated upon the colour possessed by the various objects named. My next step is to associate a *name* with the new colour. I proceed to do this in the following way :—

'You have just told me that this ball is a white one and this one is black ; now this third ball is neither white nor black. **It is yellow.**'

Unless the children are almost sure to give the correct term if asked by the teacher, it is best to associate the name at once with the new idea ; if guessing at a name is allowed, very much of the value of the previous work is lost.

I am not quite certain that the entire class know both the colour and its name; instead, however, of simply repeating the process of teaching just completed—a method which would be likely to weary the brighter members of the class—I secure both repetition and a thorough test of the knowledge acquired by all the children by the following devices:—

i. A set of differently coloured balls, such as those of Gift I., is supplied, and each child is required to choose the yellow ball from the rest.

ii. Strips of paper varying in colour, with the addition now of variation in shape, are placed near each child, and each is requested to hold up the yellow strip.

iii. Select from Gift I. the thread of the same colour as the yellow ball.

When all the members of the class are able to choose the yellow colour from the other colours presented to them, we have full proof that this particular colour is taught. In this simple sketch of a portion of a lesson we have sufficient to illustrate all we mean by '**sense training.**' In the above example it includes—

1. **Systematic intellectual exercise.**

Primarily and chiefly the power to distinguish between different colour impressions, received through the medium of the sense of sight. The white and black colours, forming the strongest contrast, had been previously taught. To these our lesson has added a third colour, viz., *yellow*. Thus **Discrimination, the first intellectual operation, has been exercised.**

Beyond the effort of Discrimination, however, the class has been exercised in recognising objects similar in colour to the white, the black, and the yellow balls respectively; and in this effort exercise has been provided in identifying similar sense impressions. **The former exercise of intellect is termed 'Discrimination,' the latter 'Assimilation.'**

2. **Rules of teaching by which this systematic exercise of intellect is secured.**

(*a*) *Proceed by regular stages from broad distinctions to narrow differences.* In the lesson just sketched

the children were first led to distinguish white from black, they then proceeded to the yellow, and an extension of the teaching would yield exercises in the different shades of the same colour.

(*b*) *Whilst contrasts are formed, the exercise should provide for the recurrence of the same impressions, and lead to their identification in the midst of varying surroundings.* The yellow colour was shown in connection with the orange, the ball, and with strips of differently coloured paper and thread, the process of identification becoming much more thorough when the agreement is recognised amidst varying surroundings of colour.

Care must be taken that the varying conditions are not too pronounced and striking, otherwise the children may fail clearly to recognise the recurring impression. These impressions would then lack definiteness, and the knowledge based upon them would be vague and uncertain.

3. Results of this systematic exercise.

(*a*) Improvement in power to distinguish the slightest change of impression.

(*b*) Increased readiness and accuracy in identifying agreement between a present impression and some similar impression, either present or recalled.

C. The Kindergarten Gifts, and Examples of the exercise each affords in sense training.

1. Gift I. consists of six balls covered with soft wool, tinted to represent the primary and secondary colours. The contrasts in this Gift are in the colours. In order to test the ability of the children to recognise each colour, the pupils are required to attach pieces of string to each ball of the same colour as the ball. In this Gift, broad distinctions and narrow differences of colour are provided; and further, the recognition of the same colour impression is required. For the exercises in the movements of the ball and games associated with them, the reader is advised to learn these by observation and practice in an infant school.

2. Gift II. consists of a ball, a cube, and a cylinder. The ball is similar in size to that in the previous Gift, but contrasts with it in being made of wood instead of wool. It is *hard* therefore instead of *soft*, is heavier than the ball in Gift I., and falls with a sharp ringing noise. The cube contrasts with the ball in having many sides, edges, and angles. The cylinder forms the connecting link between the sphere and the cube, and whilst in many respects it is unlike both, it has round sides like the sphere and flat ends like the cube.
3. Gift III. is a cube like that of Gift II. in size and material, but unlike it in being divided into eight smaller cubes. Similarity of shape and size appears in each of the smaller cubes, and these become available for construction into a great variety of forms, such as—
    i. **Object forms**—a table, a chair, a castle, a clock, &c.
    ii. **Instructive forms**—wholes, halves, quarters; addition, subtraction, multiplication, and division of units, with first notions of fractions, all shown in the concrete.
    iii. **Forms of beauty**—leading children to construct symmetrical groups of cubes, both pleasing and instructive.
4. Gift IV. is a cube the same in size as those of Gifts III. and II. It differs, however, in being divided into eight blocks of oblong shape. These blocks illustrate the ideas of length, breadth, and thickness. In Gift III. the building operations do not admit of selection of sides most suitable, but in this new Gift the child's power of selecting the right side will be exercised.
5. Gifts V. and VI. are also cubes. They are, however, divided into smaller cubes and oblongs, and some of these are again divided into triangular prisms. They permit of more complex and advanced combinations than those described under Gift III.

It is evident that in constructing these Gifts, Frœbel had in view the exercise of the child's powers of observation according to the principles of sense training already formulated and illustrated. At every new stage of the series advance begins

with some contrast; the most complex and difficult forms and operations are gradually developed from the simpler ones; there is further the constant reproduction of old and familiar forms; language is associated with each new idea as soon as required, and each exercise is made pleasant by engaging the activity of the child, and of service by adding to his stock of concrete or sense knowledge.

D. Continuation of sense training amongst older scholars.

The examples of sense training, so far, have been taken from the early teaching in the infant school. It must not, however, be assumed that the training of the senses ceases with infant school days. This branch of training should be continued throughout the entire school life, and, in this way, prepare the pupils for more efficient exercise of hand and eye which the workshop and the factory will demand. For sense training in connection with pupils over the ordinary school age, the following are examples taken from actual experience :—

1. A youth was being taught to square a piece of two-inch deal. After the rough saw marks had been planed away, and a smooth surface obtained, the effort of planing was continued until the surface appeared straight and square to the complete satisfaction of the eye of the pupil. The teacher now applied the instrument called a 'square,' and at once the defects in the planing became visible. A few more strokes of the plane, and each surface became completely true. In this case the absolutely accurate test of the instrument revealed defects which the eye at first could not recognize. After a time, the hand became more skilful in directing the plane, and the eye more ready to recognize defects, and, as a consequence, more reliable results were obtained, with a greatly lessened effort.

2. A class of older scholars was examining the solar spectrum by the assistance of the spectroscope. In nearly every case where the pupil saw the spectrum for the first time, he said, 'Yes, I see very distinctly all the colours of the rainbow, but I cannot see the dark lines which cross the colours.' The broad distinctions of colour between the violet and red of the spectrum were readily seen, but Fraunhofer's lines, which appeared quite distinct to the teacher, were not at first seen at all by the pupils. The teacher at once set to work to exercise the sight of the pupil in recognizing the lines which as yet were not discerned. He knew where, if at all, his pupils would be able to see a dark line crossing the spectrum, so he asked each in turn to concentrate his attention upon that portion of the spectrum near the junction of the red and yellow. 'Yes, I see

that one,' said they. The teacher then directed each to look towards the end of the green. 'Yes, there is another.' It was much finer than the one first discovered, but the observer readily distinguished it. The effort was continued from broad to finer and yet finer distinctions, until the spectrum was seen to be superposed with dark lines along its entire length.

Several such examples of hand and eye training have been in operation for some years past in schools in which elementary science has been taken, and in which the children have been encouraged to work experiments and to apply their knowledge in the construction of simple pieces of apparatus. These exercises are enhanced in value as means of hand and eye training where the pupils have been taught to embody, as far as possible, their notions of things and their relations in neatly finished and accurately constructed drawings.

E. Perception and observation.

It has been stated that perception is the ability to connect the impressions of sense with an external object. Various stages in this intellectual operation may be readily marked off, *e.g.*,

1. The introduction of a light into a dark room, and the association of the change with the candle or lamp, is an early form of perception.

2. The entire set of impressions which make up the schoolboy's perception of an apple is a very much more complex form of effort, including the simultaneous recognition of size, shape, colour, distance, smoothness of surface, &c.

3. Sometimes objects are examined with a view to increase our knowledge. A youth, for instance, places a solid substance, such as common salt, into a glass of water; he watches it dissolve; a solution is formed. By placing a drop of the solution upon a piece of heated glass, and then watching it with the aid of either a hand glass or a microscope, he sees the return of the salt in the form of small cubical crystals. In this example there have been other intellectual efforts besides perception, but so far as there has been perception it has been exercised upon a number of operations arranged in an orderly series. These have been closely watched by the youth in order

to increase his knowledge of the properties of the substance acted on. **The form of perception which is accompanied by a concentration of effort designed to increase our knowledge of the nature and qualities of an object, is termed 'observation.'**

THE EXERCISE AND TRAINING OF THE MEMORY.

The exercise of memory has received more attention in school work than has that of most of the other intellectual powers. As the conditions under which memory is cultivated are well understood and almost universally practised, it will be sufficient here very briefly to indicate: (i.) **How memory differs from perception;** (ii.) **what constitutes a good memory;** and (iii.) **the conditions of teaching by which improvement is secured and a good memory is formed.**

Instead of immediately proceeding to deal with these questions, it may be better for the young teacher to consider the exercise of memory in the following example, and thus be prepared for the more formal statements which follow.

The more simple the example the better will it serve for illustration. As the conditions under which the percept of an orange may be formed were set out in a previous example (see p. 21), the method of teaching there indicated is here recalled in illustration of the exercise and training of memory.

Example of memory exercise.

Recall for a moment the stage at which our teaching stopped in giving a lesson to an infant class upon the orange. An impression had been formed consisting first of the colour of the object; afterwards the qualities of size, weight, kind of surface, and taste were added. In this way a number of sense impressions became associated with the object. These, when simultaneously recognized, form the child's *percept* of an orange whenever the object is brought to view.

In order to carry the intellectual exercise of the child a stage further, the activity of child life assists the teacher; the orange has been seen in the shop, and again in the home; the child has played with it and perhaps eaten one; and now the pupil can recover the main features of the orange without the presence of the object. The child has a mental image of an orange which can be reproduced without the presence of the external object. The process is not in this case perception, for that intellectual operation depends upon the presence of the object; now, however, **a mental image is produced by a purely mental effort; and that effort constitutes the intellectual power termed 'Memory.'** A close inspection of the lesson (p. 21) will show us the method adopted by the teacher in order to make this mental image *accurate*, *permanent*, and *easily recoverable*.

(*a*) Firstly, the familiar balls are introduced to the class. For a few moments attention is concentrated upon these by means of a few questions put by the teacher upon what was learned when the white and black balls formed the subject of the lesson.

There are few school exercises which rouse children to better effort than the attempt on their part to relate what is remembered of a previous lesson. A scholar, *e.g.*, is asked to tell what he remembers of the last lesson. Were the teacher simply to repeat what the pupil now states, the repetition would be wearisome, and would most likely result in the loss of the attention which it is the main desire of the teacher to arouse; let, however, a scholar relate what he actually remembers, and at once the little fellow himself becomes most anxious to communicate his stock of knowledge, whilst the class takes from their schoolfellow these repeated facts with as much interest as they would if the facts were quite new.

This interest aroused at the opening of the lesson must be maintained throughout each of its stages. Every movement of the teacher when introducing the yellow ball should tend to the concentration of the attention of the class. An air of mystery is invoked by the mode in which the teacher slowly introduces the new ball. The ball itself has the charm of novelty as to colour. Even the titter, which probably arises upon someone suggesting a coincidence between the colour of the ball and that of the kitten or the canary, is not repressed as entirely misplaced, for by this means interest is being awakened, and attention concentrated upon the object of the lesson.

Not only are means carefully adopted for arousing and maintaining attention, the teacher as carefully removes every possible inducement either to inattention or to attention being too widely diffused. The children have had a march and a song, they are comfortably seated; the teacher's wares are not all spread out before the class at once. First, the familiar black and white balls are shown; then the teacher introduces the new ball (orange), and afterwards, the coloured

strips of paper and of thread. Such devices as these serve not only to keep alive the curiosity and interest of the class, but when, as in this lesson, they are introduced only as they are needed, the method of teaching prevents that dissipation of attention which is apt to follow the profuse display of all the objects at once.*

At every stage of his lesson the teacher is awake to the fact that true economy of time and effort, both on his part and that of his pupils, will be found in the full attention which he awakens and maintains throughout the class. Here then we note **that attention and interest form the first condition for rendering the knowledge imparted both accurate and permanent.**

(*b*) If we refer once more to the lesson which we have chosen to illustrate the conditions upon which a good memory may be cultivated, we shall find a *second* method introduced, helpful in the formation of an accurate and permanent mental image. The children were asked to name objects of the same colour as the orange. Now all the time the children were looking about for objects of the same colour as the orange, they were dwelling with the full effort of attention upon the colour, and in this way not only was attention maintained, but a **repetition** of the impression was made, and thus, by mere repetition the colour impression was deepened and rendered more permanent.

It will be shown later on, that attention and repetition are related to each other, so that the greater the attention aroused at the time of acquisition the less need there is for repetition; at the same time, even the youngest teacher must have found that interest becomes weakened by the frequent repetition of any subject.

(*c*) There is a *third* quality which every good memory exhibits, and that is a 'ready recovery' of the required image or impression. Impressions may exist, but only by slow and painful effort be recovered. Give the scholar time, and the impression will present itself again to his mind. In teaching, however, our object should be to make the knowledge imparted immediately available. If we recall the method of teaching in the lesson on 'colour' we shall find how the teaching in that lesson aimed at making the information easily and readily recoverable.

1. As soon as the yellow colour is clearly distinguished from the two colours previously taught, the name 'yellow' was associated with it. Now, the name yellow has no necessary connection with the thing it represents, but the two impressions were made to occur, and were repeated together, until the connection between the two—the impression of the colour and the sound of the word—became completely riveted; the name calls up the colour impression, and the colour itself or its image at once suggests the name. Every familiar name we utter, every known word we read is similarly connected with either a distinct mental image, or else serves to suggest various changes and conditions which things, and hence their images, undergo.

* When a number of outline diagrams have been prepared in illustration of a lesson, it is found to be difficult to keep the attention of the class fixed upon the one illustrating the stage of the lesson under discussion. In this case it is well to cover with paper the diagrams which are not required, and show these to the class only when the stage in the lesson which they illustrate is reached.

This connection between words and things, and the images of the things, is termed '**Association,**' and in the case quoted above is an '**Association of time and place.**' **Another name is 'Association by Contiguity.'**

2. Another and wider bond of association was made when the yellow flower, the yellow dress, and the canary, were connected with the orange. Here a number of objects, very different from each other in many respects, are brought together because of the common colour. There is a recognized similarity between these objects. This similarity forms a connecting link between the mental images, so that when one is called to mind the others present themselves; thus, the orange suggests the canary, the yellow flower suggests the orange, and so on. The form of association here illustrated is '**association by similarity.**'

   This form of association is strongest when only two images are associated and when these have many points of resemblance between them as, *e.g.*, when two persons resemble one another in many features, the presence of one immediately suggests the other; the town of Nantwich suggests Northwich both on account of the similarity in name and similarity of production.

3. A higher form of association may be formed in future years, when, in taking a simple science lesson, the reason of the colour of different objects is explained. The scholar will then learn that the rind of the orange and the feathers of the canary are both yellow for the same reason, viz., because they reflect light rays of the same wave length. It is not now merely similarity of sense impression which forms the connecting link between the two images, but a similarity of cause producing the same effect; a general and scientific law has been established and both objects are referred to it in explanation of the similarity in their colour. This association of cause and effect is essentially the same as association by similarity. It is, however, sometimes separately named '**Association of Reason**' or of '**Cause and Effect.**'

Thus far our lesson has illustrated certain conditions of teaching which result in making the mental image accurate, permanent, and readily recoverable. When these conditions are fully recognized, and when we conform to them in our methods of teaching, we may be said to cultivate or train the memory. It remains for us now to state in fuller detail the various truths respecting memory which have been illustrated in the above lesson.

A. How memory differs from Perception.

In perception an object must be present and manifest itself to one or more of the organs of sense. We have just seen that the intellect has power to retain the impressions it receives through perception after the object is withdrawn. These retained impressions form what is termed a mental image, and

the retention and recall of this image are acts of memory. The percept differs further from the mental image in being more distinct and the further removed the recall of the mental image is, in time, from the actual percept, the less distinct does the mental image appear.

In order to make the distinction between memory and perception as clear as possible, very simple forms of the mental image have been selected. It should be noted, however, that memory acts, not only in retaining and recalling mental images of objects, but that words and sentences, the records of the higher intellectual exercises, are similarly retained and reproduced.

Whilst memory is thus seen to follow perception, and to make more or less permanent the knowledge obtained by that power, the effort of retention is, at the same time, essential to the formation of a percept. This truth is evident when the process by which a percept is formed is reviewed. There is first a sense impression, but it is not immediately associated with the external object; when, however, the sense impression is repeated, it is finally identified as having been experienced before (*an act of Memory*), and in connection with the external object causing it (*Perception*).

B. What constitutes a good memory.

Briefly stated, a good memory manifests the following qualities: (i.) Knowledge in its various forms is easily yet firmly retained; (ii.) It is readily recovered; (iii.) The recovered knowledge is distinct and reliable.

A child possessing a good memory will generally be found also to possess the power of keen observation, and further, the impressions which it receives through the medium of sight—the most valuable of the intellectual senses, will be best remembered. In proof of the latter statement, it is a well-known experience in teaching that the spelling of English words—an exercise which demands the use of the memory more than any other school effort—is mainly dependent upon the sight impressions of these words. Hence, oral spelling is not nearly so effective a means of learning to spell as the exercises of reading and transcription. Some children manifest a power of remembering particular impressions—sounds for instance—in a remarkable degree, whilst their power of general memory is not above the average. In school work, dealing as we do with large classes of children, it is our duty to practise memory in retaining impressions obtained through all the intellectual senses, noticing remarkable proficiency in any scholar only by way of incentive to the other members of the class.

C. Conditions of teaching by which the improvement of the power of memory may be secured —Training the memory.

The ability, which many teachers manifest, of presenting knowledge to their pupils under the best possible conditions for retention, is the chief secret of their success. This is the explanation also of the excellent power of storing knowledge which their pupils exhibit, for knowledge rightly acquired becomes a permanent and readily displayed possession. Young teachers, moreover, who have been trained both to acquire knowledge under these conditions and to present it after the pattern of such teachers, form, of themselves, a race of successful teachers; their power has been a growth, the origin and ground of which they are unable to state, but the existence of which is abundantly testified in the success following their efforts throughout their entire career. If the methods by which these successful teachers secure the permanent retention and the ready reproduction of knowledge be examined, it will be found that they fulfil the following three conditions, viz., **Interest, Repetition,** and **Association.** The first two of these are general conditions which memory shares with perception and those higher intellectual exercises which future chapters will explain. The 'laws of association' are more emphatically the conditions under which a good memory may be developed.

1. Interest and Repetition.

It has already been stated that interest and repetition exhibit a mutual relationship, for where interest in a subject runs high the attention is in consequence concentrated, and there is but little necessity for repetition; on the other hand, when an impression, a fact, or a truth is frequently repeated, it gradually loses much of its novelty—the interest it arouses, and the attention it commands become correspondingly small. It is characteristic of bright and successful teaching that it seeks to secure permanent acquisitions by stimulating the interest, and by controlling the attention of the pupil, whilst dull teaching makes up for vividness of impression by wearisome repetition.

Examples of single impressions made permanent through '*interest*':—

1. A beautiful landscape once seen can be readily and accurately recalled after many years.

2. A storm at sea once experienced is never forgotten.

3. In an experiment, when after carefully arranging a succession of operations the desired result is obtained, the delight with which the pupil regards the whole effort is sufficient to fix the entire series of operations, together with the result, permanently in the mind.

Examples of acquisition by means of '*repetition*':—

1. The learning of tables.
2. Oral spelling.
3. Simultaneous repetition of a string of capes and bays in geography, and of dates in history.
4. Verses of poetry 'learned by heart.' Rules of arithmetic and definitions of grammar when taught without illustrative examples.

Place and Value of Revisions.

Every lesson aims at imparting some new knowledge. If the lesson has been skilfully arranged this new knowledge has been taught in the order in which it will be best retained. In a lesson extending to 45 minutes in length a pause should be allowed every 8 or 10 minutes, and the new matter passed under review by means of questions distributed fairly over the class. The questions should, furthermore, be put in the order in which the matter has been acquired by the class, and no new matter should be interposed until the review is complete. In complying thus with one of the conditions by which knowledge is made permanent, it is very important that the young teacher, when preparing his lesson, should fix in his mind the most favourable positions for the revision. It should, as far as possible, be at the end of a definite stage of the lesson, before too many facts have been accumulated, and never immediately upon the communication of two or three items of information only.*

2. Association.—The conditions specially necessary for the cultivation and improvement of memory are the various forms of Association. These are constantly being used in our teaching exercises, and it will be sufficient here to enumerate a few examples illustrative of each. These examples of Association may be arranged in the following three classes, viz., (1) **Contiguity,** (2) **Similarity,** (3) **Contrast.**

(a) Association of Contiguity.

The ringing of a bell with the change of lesson.
The sound of the school whistle and instant quiet.
The recurrence of day and night, the seasons, and the months.
The succession of events throughout the day.
(*Time Associations.*)
Events with places, as school with lessons, Waterloo with Wellington, the landing of the Conqueror with Pevensey and the battle of Hastings.

* The subject is more fully dealt with under 'Questions of Revision.'

Several objects allied in position, as (1) the Thames, Westminster Bridge, and the Houses of Parliament ; (2) the sea shore, the rising tide, and the bathing machines.

(*Place Associations.*)

Things with their names, and words with mental images.

(*Verbal Association.*)

'Whenever the mind connects two or more impressions, facts, objects, or experiences because they have occurred together, this is an illustration of the law of contiguity.'*

Interest and Repetition play an important part in rendering these contiguous associations permanent and their simultaneous recovery easy and certain ; the greater the interest which is aroused when two items of knowledge are associated, and the more frequently the association is repeated, the more complete becomes the union between them.

(b) Association by Similarity.

The impressions we receive, the objects we observe, the facts we learn, and the new experiences we have, are almost sure to be similar in some respects to those with which we have previously become acquainted. The recognition of these points of similarity is very helpful towards both the acquisition and the retention of knowledge.

Examples.

1. In the child's first attempts at reading, the effect of certain letters like the final **e**, is soon recognised. The child associates this with the lengthening of the preceding vowel, as in the words *hope*, *rope*, &c.
2. In writing, the similar heights of the letters **t** and **p**, and of the letters **l**, **f**, **h** and **k** become helpful in teaching and in remembering.
3. In geography the similarity in character of the East Coasts of England, of Ireland, and of Scandinavia forms an association helpful to memory. That the four chalk ranges in England all radiate eastward from Salisbury Plain, and that each is terminated by a bold chalky headland, are similar facts which form an association serving to retain quite an array of geographical truths.
4. In grammar the chief object of the study is the classification of words, phrases, and sentences on the ground of similarity.
5. Elementary science is not of value for the wide array of facts it collects so much as for the careful arrangement of these facts according to the similarities which can be established between them.

It is very important for the young teacher to remember that his pupils should be mainly instrumental in recognising these similarities for themselves, if the effort is to be one of high value for the exercise of memory.

* Sully, 'Teachers' Handbook of Psychology.'

Success on the part of the learner to identify a similar impression, fact, or truth, is very stimulating to effort on his part. Power is being made manifest; and once the pleasure of successfully exercising this power for himself is experienced, the delight it affords is sufficient stimulus to further effort.

(c) **Association by contrast.**—This is a favourite and very effective device in teaching. Association by contrast is often sufficient to effect the recall of both impressions when one is mentioned; it is further a means of rendering both impressions more distinct at the time of acquisition, and more clear and full when they are recalled. It will be seen, however, in after chapters, when the great value of the power to group our knowledge under similarity is recognised, that this method of association by contrast is not of the highest value for progress in intellectual force. The higher operations of intellect all depend upon the power to recognise and group similar impressions, facts, and truths. Hence, the important place which association by similarity holds in any system of teaching which aims at not only securing the retention of vast stores of information in the memory, but at making these so related to one another that they shall be conducive to the higher work of conception, judgment and reason.

Examples of association by contrast.

From Geography.

The smallest county in England is contrasted with Yorkshire, the largest.
The Pennine Chain with the Cumbrian Group.
The low and but slightly indented coast of England on the east with the rocky and indented coast-line on the west.
The upper course of a river with its rapid current and narrow valleys, with the sluggish flow and the spreading plain at the river's mouth.

From Grammar.

The noun is contrasted with the verb.
The preposition with the conjunction.
The nominative case with the objective.
The compound sentence with the complex sentence.
The various uses of such words as that, before and but.

From Arithmetic.

Addition is contrasted with subtraction.
Multiplication is the reverse of division.
Integers are contrasted with fractions, fractions with fragments, and vulgar fractions with decimal fractions.

The value of contrast as a teaching device may now be stated. It is in full accord with the primary operation of intellect, viz., that of recognising difference. As this is the earliest of the intellectual powers so it is the easiest, and hence, when the teacher places his matter in strong contrasts, he works upon a developed intellectual force which the child has learned to use, and which produces the best immediate results with the least expenditure of effort.

D. Recollection, and what we can remember.

Mental images, facts, truths and experiences of the past are constantly coursing through the mind, and we fail very frequently to recognise the associations which suggest them. At other times we find ourselves unable for a time to recall a desired image, fact, or truth, no matter how earnestly we set ourselves to the task. We follow first one line of association, and finding it fail we try another, and perhaps abandon this as useless and attempt a third, until at last the desired knowledge is reached. This succession of efforts is termed **'recollection.'** In such search after knowledge as this we see the great value of having a number of associations by which information once acquired may be reached.

Example of multiplied associations.

> In learning the geography of any district the relationships between mountains, hills, valleys and rivers are learned in connection with their distribution as they appeal to the eye on a model, and less vividly as they are pourtrayed on the sketch map; there is the further effort of associating each feature with its name as it is both spoken and written; and lastly, there is the association of natural relation (of cause and effect):—the mountain range with the direction of the river; the river with the valley it has formed; the valleys, again, separated from each other by ridges of outstanding hills. All these associations are available whenever the physical aspects of a district are being taught, the result of such teaching being that when any of the facts are required the pupil has many lines of suggestion by which the desired knowledge may be reached.

Sometimes, however, all effort fails in consequence of either weakness of association or failure to discover the right clue, and then the effort of recovery is abandoned.

The value of association during the period of learning is now apparent. There is scarcely a new fact or truth that need be learned in an isolated way. 'Associate' should be the young teacher's constant watchword. In laying special stress upon this condition of successful teaching we feel confident that we are rendering a service to every beginner of the teaching art who will follow our advice.

E. Development of Memory and the changes in teaching methods which this development demands.

Experience in teaching children soon reveals the truth, that children do not respond to the same conditions of memory

exercise throughout the entire period of school life. The early conditions of acquisition are mainly those of interest and repetition, and association by contrast; in later school life, associations may be forged with less accompaniment of interest and with increasing regard to associations by similarity and the related associations of cause and effect. The subjects we teach, and our methods of presenting information, must conform to the changes of conditions thus indicated, *e.g.*—

In lower classes we awaken interest by novelty in the object under discussion or by the way in which it is presented to the class, and as soon as we find effort is becoming exhausted the topic is changed. We further find that young children readily yield to the simplest forms of association without question; a name, for instance, is associated with any object and the union is permanently fixed without the slightest hesitation, whilst in adult life we enquire why such a name has been given to any new object before we receive and use it. Then, again, how readily young children give themselves to the mechanical exercise of repetition.

This is evidently the age, therefore, when tables are most readily acquired; when the irregularities of spelling the small and common words are with least difficulty mastered; when the more or less arbitrary connection between words and things is best established, and when names and isolated facts are accumulated most freely. Further, if any of these very necessary operations be delayed unduly, the learner is seriously hampered in all after acquisitions based upon them. It therefore becomes of great importance that those operations of intellect, demanding the grouping of facts according to their similarities, and the consequent establishment of rules and truths, should not draw off too much effort at this early stage. The intellect should be free to exercise fully the power which up to the age of eight or nine years it appears to possess in maximum amount, viz., that of acquiring knowledge of surrounding objects and other common things through the operation of the senses, and also that of storing up the names both oral and written which set forth their number, their qualities, and their relations to one another. The manual exercises of writing and drawing together with that of modelling serve to set out their knowledge in a variety of aspects; these exercises further secure the repetition necessary for accurate and permanent impression, and yield that training of hand and eye which will be of the greatest service in after life.

In the higher classes our pupils are capable of concentrating their attention on topics less interesting in themselves than those presented to the younger children. Simple repetition of information, with no attempt at establishing connections with other knowledge, becomes now a wearisome exercise. The power of classifying the knowledge already in possession, and of arranging new matter in association with similar matter already acquired, manifests itself and craves for exercise. A change has come over the mode by which memory seeks to retain its stores of knowledge, and our method of teaching must be brought into harmony with the change, *e.g.*—

1. **The Reading Lesson,** instead of simply associating words with sounds, and producing what is termed a mechanical result, is marked

by an attempt at expression. Now, in so far as the pupil is successful in the effort of expressive reading, he is successful in connecting the thought of the author with similar experiences and thoughts of his own.

2. **The Grammar Lesson** at this stage exercises the pupil almost exclusively in formulating general rules, in framing definitions, and in applying both in the exercises of parsing and analysis. In the first two operations, examples must be grouped on the ground of similarity, and their several points of agreement identified. The general terms noun, verb, simple sentence, &c., symbolise or register the resembling features of each of the groups named, and the definition sets them out. Both term and definition are permanently retained and immediately reproduced when the knowledge has been acquired by the method just traced.

   It is true that the terms and definitions of Grammar are frequently 'learned by heart' by simple repetition. The effort, however, so far as the exercise of memory is concerned, is a wearisome one, whilst educationally the effect is to dull instead of to brighten and develop the intellect.

3. **Science Teaching** to be of the highest value does not consist of the mere learning of isolated facts and of skilfully-worded definitions: it is a condition of sound teaching in elementary science that it proceeds by experiment, by statement, and by reasoning. Now, the experiment is a sequence of related facts or events, the entire series being observed and understood from the materials with which it begins to the result with which it ends. By statement we are able to reproduce and record the full sequence of events and to register the final result. This record is now associated with other experiments and results, and by a process of reasoning the similar effects are collected into a general truth or principle. The latter effort will be better understood after the chapter on reasoning has been read. It is sufficient here to note that observations and experiments are mainly valuable in science teaching in so far as we are able to identify common conditions and establish similar results. Hence, the effort at scientific enquiry is very largely 'association by similarity.'

   It may be objected that this is not an effort of memory so much as it is an exercise in gaining knowledge, and further, that other powers are equally exercised with memory. No doubt other powers of intellect are engaged; at the same time, the grouping of facts is clearly an exercise in association by similarity. The memory is also aided by the effort required to recognise the common or resembling features of the group. Thus two important conditions for the retention, both of the facts compared and the general truth illustrated, are recognised. These are association and concentration. In this way it may be shown that the cultivation of the understanding by a series of lessons in science and in grammar may become a means of training the memory. On the other hand, memory sometimes hinders the understanding, as when a proposition in Euclid is learned by heart, and when a rule of arithmetic is remembered and applied without a knowledge of the reason of each of the stages in the working.

Conclusions.

So far, our consideration of memory, as an intellectual effort, has enabled us to distinguish it from that of perception; we have also seen the qualities which go to make a good memory; and, further, the conditions by which our methods of teaching may serve to improve this intellectual power. It is clear that success in the training and development of memory requires the awakened interest and concentrated attention of the pupil; that new matter should be repeated; and that at the time of acquisition the pupil should avail himself of the various forms of association, viz., those of contiguity, contrast, and similarity. Lastly, whilst association by contiguity and contrast are forms which are readily applied in early school days, our teaching should especially develop the power of association by similarity, and in this way seek to prepare our pupils for the higher intellectual efforts of later school work.

Sufficient has been stated to guard the young teacher from assuming that memory is a power entirely distinct from other powers of the intellect. It has been shown that a form of memory is necessary for the exercise of perception, and we have just seen how the cultivation of the understanding yields most valuable exercise in memory training. It remains to add, that to store the mind with an abundance of facts is not education in its true and full meaning. A certain supply of facts must be acquired and retained before intellectual work higher than memory can be attempted. The storing of facts, however, instead of being considered the end of education, should be looked upon as supplying the means by which the higher processes of mind can be exercised.

THE EXERCISE OF THE IMAGINATION IN SCHOOL WORK.

A. **Memory versus Imagination.**—The memory and the imagination have so much in common that the possession of a fairly full knowledge of the one enables us readily to recognise and understand sufficient of the other for all purposes of teaching. We have already seen that memory in its commonly accepted meaning is the calling up of a mental image or of a truth either at the suggestion of a word or a

sentence, or in association with other objects, mental images, facts or truths with which it was connected at the time of acquisition. Imagination, like the memory, deals with mental images; the images however which memory supplies can be rearranged or regrouped by a purely mental effort, and in this way our knowledge may be extended beyond that obtained through observation and retained by memory. The power of mind by which we take the images supplied by memory and regroup them for the purpose of realising knowledge beyond that of actual experience, is termed Imagination.

B. Illustrations taken from experiences in teaching.

(1) **Memory and Imagination.**—A scholar living in Westminster has frequently seen the Thames, Westminster Bridge, and the Houses of Parliament at one and the same time; the mention of Westminster Bridge not only calls to mind the image of the bridge, but also those of the river beneath and the Parliament Houses on the side; so far memory acts alone; but suppose a lad in Newcastle is being taught the same group of geographical facts; he has not the advantage of the London boy; direct observation cannot take immediate cognisance of any of the facts, and memory, therefore, has no material upon which to work; how then is the knowledge to be acquired? By the following method:—the Newcastle boy has seen the river Tyne, has perhaps been towards its mouth, he knows the high level bridge joining Newcastle with Gateshead, and he is well acquainted with the buildings on either bank of the river. All these are quite familiar, and good images of each of the facts come to his mind immediately the names are mentioned. So far, he adds nothing to his stock of knowledge; following, however, the directions of the teacher, he mentally widens the river, he lowers the bridge, instead of factories he places on the banks the most magnificent buildings he has seen, and in this way his mind, aided by pictures and his teacher's statements, effects quite a transformation in the group of images which his memory at first supplied. **This transformation of the images of memory is the intellectual effort termed Imagination.**

(2) **Geography and Imagination.**—A very large part of the knowledge of the descriptive geography of his own country, and that of all distant lands not actually visited, is gained by the aid of imagination. This intellectual power uses up the materials which observation, aided by pictures, models and maps, supplies, and elaborates out of these materials fresh geographical knowledge. When thus we consider that nearly the whole of our knowledge of the surface, of the contour, and of the inhabitants with their appearance and modes of life, of all the countries of the world beyond the narrow range of our own actual experience, is elaborated for us by imagination out of the scanty materials which experience supplies, and which memory recalls, two truths become very evident, viz.: (1) the great importance of the imagination for the purposes of gaining new knowledge; (2) the necessity of first obtaining a large amount of observed knowledge upon which the new knowledge may be based.

(3) Suggestions for teaching Geography.

(*a*) *The varying condition of children.*

The young teacher whose work is with children from the crowded alleys of our large towns will at once recognise the narrow basis upon which the entire fabric of his geographical instruction must rest. The picture and the model, under such conditions as these, become essential to real progress. With the child, however, whose home is near hill, valley, sea, cliff, river, and mountain, the conditions are much more favourable. Knowledge of these several features has been gained by direct observation, and as a result, mental images of them are vivid and accurate, and any transformations of them by imagination become correspondingly clear and correct.

(*b*) *A favourable condition for teaching.*

The teacher who attempts to guide and stimulate imaginative effort on the part of his class during oral instruction in geography should be in possession himself of the most vivid images which familiar and wide experience, gained largely by actual contact with natural scenery, can supply. Compare, for example, the different effects produced upon the same children by a teacher simply stating a number of geographical facts gleaned from a text-book, with the effect produced by the same teacher giving a graphic account of a visit made by himself to some district hitherto unknown to the class. The former exercise is dull and uninspiring, the facts are driven home by wearisome repetition; they are thus lodged in the children's memories, and there they rest. Now turn to the account of scenes actually visited; the language is simple, the order of events natural, there is something inspiring in the teacher's voice, gesture enlarges the teacher's language and guides the pupils' thought, and the state of feeling necessary to the full activity of the imagination is manifest in the teacher's manner and is displayed in the effort of the class. The whole series of geographical facts is made to live over again in the teacher's mind—to him the effort is one of memory; to his class the effort to share to the full the experience of the teacher is also memory so far as his words call up mental images, accompanied, however, by imagination so far as his pupils are able to transform these into harmony with those of their teacher.

(*c*) *The text-book order not best for teaching.*

It should now be evident that if we wish to awaken the imagination as well as store the memory, our teaching of the facts of geography must depart from the arrangement generally found in text-books. To learn, for example, that North Foreland and South Foreland are headlands following one another on the east coast of Kent is an association by contiguity helpful to memory; the fact that both are cliffs of considerable height and composed of chalk is an association by similarity again helpful to memory. The teacher, however, who wishes to exercise the imagination as well as the memory would find it necessary to take each headland, and by

means of model, map, and statement, enable the class to realise the entire group of natural features connected with it; these are the ridge of chalk 'downs' terminating on the promontory, the steep headland itself, with its cliff of chalk, facing the sea, and the coast retiring on either side to meet the adjoining valleys at their lowest points. These are the geographical facts which group themselves round each headland; any one visiting the district would name them in any description he wished to give; when, therefore, in our teaching, we put our pupils, as near as may be, into the position of those who have actually seen the district, we do all that is possible towards awakening the imagination, and, at the same time, we supply the most reliable and valuable knowledge of geography.

(4) **The Reading Lesson and Imagination.**—The following sentence may be taken to illustrate the form of exercise of the imagination which most reading lessons afford: 'The orange tree is a rare instance of a plant sufficiently vigorous to have at once beautiful shining leaves, fragrant flowers and delicious nourishing fruit.'

The aim of the teaching here is to secure expressive reading. In order to do this the meaning must be clear. How is this to be secured? Our English children know the fruit, but very few have seen the fruit and the flower in position on the tree. The teacher desires to supply this knowledge. If the class could be taken to Kew Gardens the tree might be shown. The process of acquisition would then be by *perception*. The teacher, however, cannot do this, so must be content to use whatever material he may find available. The class has some knowledge of evergreens; the Christmas tree will do good service; furthermore, the teacher is able perhaps to show the leaf of the orange tree, and can possibly draw a general outline of stem and branches on the board; then he calls to mind the fruit which all know, together with the blossom, a picture of which he is able to show; and with this collection of impressions the class proceeds to realise the new grouping of images indicated in the paragraph just read. By a distinct intellectual effort the pupil is able to elaborate out of the impressions just enumerated a new image which for the present represents his knowledge of the orange tree. **The intellectual effort by which the scholar takes the impressions at hand** (some of which are observed, others recalled) **and fashions out of them his image of the orange tree is termed imagination.**

Thus when a book is read, the reader is constantly regrouping images. Each word, if known, is sufficient to call up the impression or image associated with it, and so far the action is one of memory; the order of the words, however, in all cases where something new is stated, determines the grouping of these images and thus calls forth the exercise of the imagination.

If this be correct, then :—

(*a*) Every line in a reading book presents material upon which imagination may be exercised.

(*b*) In selecting a reading book care must be taken that whilst new information is conveyed the words contained in the text should be associated with distinct mental images (memory), and, further, the regrouping (imagination) should not be above the capacity of the pupil.

(*c*) The place for the explanation of entirely new words should precede the reading effort unless, in reading over the entire passage, the context sufficiently explains the meaning.

(*d*) Good reading requires that the images suggested by the words be fairly within the child's knowledge, and, further, that they be regrouped by means of an active imagination.

(5) **Oral teaching and the Imagination.**—Oral teaching, like reading, depends for its success upon the pupil's ability to take the images suggested by the words of the speaker, and to rearrange these by an effort of imagination. If this effort is to be successful the young teacher must always be on his guard against using difficult and unfamiliar words, for then energy is largely absorbed in the effort of memory, leaving very little for that of imagination.

The character of *verbal* illustration can now be readily determined. It must be familiar, *i.e.*, the words used must at once be accompanied by the mental images corresponding to them. If, for example, in giving an oral account of the tiger I state that 'the tiger is like the cat in figure, and the mastiff in size,' the terms 'cat' and 'mastiff' are introduced for purposes of illustration; as soon as these names are mentioned a mental image of each presents itself. If, however, the class proceeded no further than this, the exercise would be that of memory only, and knowledge would remain as before. It is in combining the images supplied by memory, *i.e.*, in maintaining the shape of the cat whilst enlarging the figure in all its parts to the size of the mastiff, that the effort of imagination consists. The result is a new image—the effect of an imaginative exercise working upon the familiar illustrations which our oral statements suggest.

Oral description occupies a very large proportion of school instruction. It requires, as an essential condition of success, that the pupils possess a considerable store of images obtained through observation. It demands also, on the part of the learner, the constant and combined

exercise of memory and of imagination, and thus it prepares him for the acquisition of knowledge through reading. This preparation for successful effort in reading is the more important when it is remembered that, by this means, knowledge will be mainly increased when the pupil leaves school.

(6) **Conversation and Imagination.**—When oral exercises partake most of the nature of a conversation between teacher and taught, the results are most satisfactory. The reason of this is clear. If, in our teaching, we indulge in long and continuous statements in the lecture style, it must frequently happen that language is introduced, clear to us, but not understood by the class. By this we mean that the words do not call to the minds of the children the required images, and, as a result, there is a break in the continuity of their thought. The practised teacher soon recognises this failure on the part of his class to follow him; he pauses, and tries, by questioning, to get at their mental condition; their answers reveal the nature of their ignorance; further and more familiar illustration is now introduced, and this, together with a more simple statement, enables him to lead his pupils to full and accurate knowledge.

The necessity for pause and break for the purpose of questioning the class in order to discover their mental condition by the answers and other statements they are encouraged to make, becomes greater the younger and less informed the child. The store of knowledge in the infant class is necessarily very limited, but so far as teaching by oral statement is concerned, it is necessary for our words to keep well within that limit. We should, however, strive our utmost to lead our pupils to re-arrange their mental images, and, by the effort of imagination, to increase their stock of ideas. This cannot be well done, however, except under the following conditions, viz. :—

i. That as teachers who have long since passed the condition of the infant mind, we constantly endeavour to discover that condition by encouraging our youthful pupils to speak, and thus reveal it.

ii. That as pupils, the younger in years, the more essential it becomes that they should be directed to observe accurately, and to form vivid and clear mental images in association with words, so that when, through oral statements, they are required to recall and rearrange their mental images, these may be found reliable material upon which to base their further knowledge.

(7) **Pictorial illustrations** are more helpful to imagination than verbal descriptions for three reasons: *firstly*, they either are, or should be, more clear and full than the images which

memory revives at the suggestion of words; *secondly*, they relieve the mind from the effort required to recall the mental image, and so the intellect is left free to concentrate itself upon the exercise of the imagination; and, *finally*, there is an accompaniment of feeling which every good picture arouses, and which every successful effort of imagination requires.

The effort of the imagination when a good pictorial representation is used is limited to that of enlarging to the natural size the objects or groups of objects shown on the picture. Here the only difficulty is in fixing some standard of size to which the learner may refer, *e.g.*—

> The picture most effective in assisting the pupil to form a correct notion of the tiger should present both cat and tiger side by side. Then, as the size of the cat is familiar, the sole effort left for the exercise of imagination would be that of enlarging the pictures to their natural size.

(8) The value of Objects, Models, Pictures, and Description respectively.

The mind obtains direct impressions from objects through the operations of the senses. These impressions are stored by memory in the form of mental images. The mental image thus obtained is one of the most complete, vivid, and lasting of the various forms of knowledge we possess. Next to objects themselves, models and pictures are most helpful to complete and exact knowledge. They are especially useful in the case of the young, because in them we are able to present the essential features only of the object or objects under review. They leave some work for imagination in the form of enlargement and colouring, not however of a very high or difficult order.

> Here it may be noticed that whilst good pictures and faithful models are of great value for teaching purposes, a blurred picture and a grossly exaggerated model may be positively misleading, the errors being perpetuated not only in the mental images which the memory recalls, but in the subsequent structures which the imagination elaborates.

Descriptions obtained in reading, or received by oral communication, make a demand upon both the memory and the imagination, hence the intellectual effort is higher in following an oral description than when objects, models, or pictures are being observed. When, however, a wide basis of observed knowledge has been secured, the description becomes a most

rapid and reliable mode of acquisition; rapid because mental images appear in succession as quickly as the words are received, and reliable because of the vividness and accuracy with which the images obtained by direct observation are recalled by memory and rearranged by imagination.

(9) Memory and Imagination mutually helpful.
It may be useful here to indicate how the imagination and the memory act and react upon one another. It is evident from the preceding illustration that imagination depends upon memory for the material upon which it exercises itself; it must also be clear that imagination will effect valuable and reliable results in proportion as the images supplied by memory are vivid and accurate. So far, therefore, imagination is beholden to memory. Is there any return for this service or, in other words, does memory derive any advantage from the exercise of imagination? Evidently the exercise of the imagination requires the frequent review of the stores of mental images lodged in the memory. This review of images is a form of repetition of knowledge already in possession, and is therefore helpful to its permanent retention. There is association—the most essential condition of memory training. The new image of the tiger, for example, in the illustration quoted above, has been formed out of a combination of the images of the cat and mastiff, hence it is associated with both. There has been finally the concentration of the mind during the effort of memory, in recalling the sizes of both cat and mastiff, and, during the exercise of imagination, in the formation of the new image. Here, then, in the effort of imagination we have all the conditions of a memory exercise fulfilled, viz., (1) Concentration of mind, (2) Repetition, and (3) Association.

C. Imagination and the realisation of the ideal.

When the power of imagination has been exercised in the pursuit of knowledge as indicated above, it becomes available for further effort. We may extend our regrouping of the images which the memory stores and recalls for the purpose of realising the beautiful and the sublime.

> 'When Britain first at Heaven's command
> Arose from out the azure main.'

In the verses beginning with this couplet the poet, ignoring the knowledge which modern science has taught respecting the frequent submergence and upheaval of our present insular abode, leads the reader to summon a special interposition by which this sea-girt home was brought into being for special ends. This view of the origin of Britain, subsequently to be peopled by a free race, whose destiny (according to the poet) is to be as marvellous as their origin was miraculous, is poetic, but not scientific. The fancy of the poet, however, so

thoroughly harmonises with the patriotic feelings of the true Briton, and appeals so strongly to his natural pride, that it finds a response in every breast, and stimulates to action in sympathy with the noble ideal it pourtrays.

Here, then, we have a simple illustration of that form of imagination which does not serve immediately the ends of knowledge; it has its value, however, for it carries the mind beyond the range of mere experience and outside the range of scientific proof; it embodies the higher aspirations of the noblest minds, and it serves to stimulate conduct towards the attainment of the highest and best.

It may be stated in concluding this brief account of the imagination in relation to school work that, in addition to the reading lesson and the lessons in geography, the imagination necessarily plays a most important part in the learning of history, and also, though to a less extent, in elementary science. It will thus be seen that imagination in its exercise is not antagonistic to the acquisition of knowledge; on the contrary, it lends itself most readily to the possession of many forms of knowledge. The unimaginative is the one who is naturally dull, and who but slowly realises facts and conditions of things beyond the range of his own narrow experience. Even the scientist owes to his imagination the power to frame the hypotheses by which he explains phenomena whose conditions are beyond actual observation.

D. Growth of the Imagination.

If we watch children at play, they will be seen to exhibit a remarkable power of transforming their toys into living realities, and of making their games into little acts, in which each figure plays an assumed part. Place a child alone in a dark room at night; it sees nothing; no object presents itself for direct observation; the child's mind, however, is soon filled with images, and, if of a nervous temperament, its state of fear leads it to select those images of which it is most afraid; the child's terror is thereby increased, and only when a light is introduced by some friendly hand does it become pacified. The stories which children read with pleasure are for the most part those in which familiar objects are made to assume the most unlooked for and unreal positions.

The examples quoted above illustrate some of the many forms in which a child's imagination manifests itself. It is characteristic of the imagination at this period of life that it is—

i. Unrestrained rather than controlled.
ii. Roused by feeling rather than stimulated by intelligence.
iii. Exercised in order to gratify a pleasurable emotion or increase a painful state rather than to increase knowledge.

In contrast with this early form of imagination is that exercised by the youth who is making an attempt to realise the movement of a heavenly body, say that of the moon.* The movement is beyond the range of direct sense observation, and demands a considerable effort of imagination, and even then it is difficult to construct a complete image of the motion without calling in the aid of either model or drawing.

In the first place certain positions occupied by the moon are observed, *e.g.*, the positions of *full* moon on the side of the earth directly opposite to that occupied by the sun, and of *new* moon on the same side of the earth as the sun. Now, in order to change from the full moon position to that of new moon, the satellite must move half-way round the earth, and in changing back to full moon again the satellite must move a second time half-way round the earth, only this time in a direction which, when viewed from the earth, must appear opposite to that of the first movement. If the earth's movement during this period be added to the account, it will be evident that the first notion of the moon moving round the earth in something like a circle cannot be correct. Now the youth must picture the moon moving forward along with the earth round the sun, and at the same time crossing the earth's path twice every month, so that at one time it is on the further

side of the earth rom the sun, viz., at M_1, *i.e.*, in the position of full moon, and in a fortnight's time on the side nearest the sun, viz., at M_2, *i.e.*, in the position of new moon. A further consideration will show that, whilst the moon is passing from M_1 to the position A, where it crosses near the track of the earth, its motion must be faster than that of the earth, and that from this point of its course to the new moon phase, M_2, the moon's motion must be slower than that of the earth ; then from M_2 to B, where the moon is near the earth's track again, its movement must be slower than the movement of the earth, whilst from B to M_3, *i.e.*, to the full moon phase, at which we started, the movement is again faster than that of the earth round the sun.

* This movement is selected because it is one which every young teacher will require to know. If not known already, an opportunity for the exercise of the higher form of imagination will be afforded.

The successful effort to picture these somewhat complicated movements affords an example of the exercise of the imagination, made for the purpose of gaining knowledge. This is the controlled form of the power, guided by an effort of intelligence, which admits into the mental image only those movements which explain the appearances presented by the moon during its successive phases.

E. Conclusions for guidance in teaching.

The above examples set forth the early and the mature forms of the imagination respectively. Progress is manifest in the gradual change from the uncontrolled form of imagination characteristic of early childhood, to the regulated form exercised in after life. The young teacher must bear in mind that the early form is the one out of which the later form of imagination develops, and that, therefore, the childlike imagination is not to be restrained unduly, but rather to be guided by well-devised exercise so as gradually to assume the more serious and regulated power, which, when developed, is capable of bearing abundant fruit, as much for the delight it affords as for the knowledge it supplies.

1. The value of play in childhood, from an intellectual aspect, is now apparent. The merry laugh is often awakened, more from what the imagination pourtrays than from what the eye sees, as when children play at horses, have a game at 'out to tea,' or 'tell a tale.'
2. The 'object forms' made by infants by means of the cubes and bricks of the Kindergarten Gifts leave ample scope for the exercise of the imagination. The forms they construct suggest roughly the structures they imitate. The effort, in this way, is controlled to a limited extent.
3. The contriving of new designs by means of straw or mat plaiting is a distinct advance towards the controlled form of the imagination.
4. Modelling in clay, and working with a readily changeable material such as cardboard, and especially any development of skill in drawing, are all pre-eminently fitted for the exercise of the observing powers, and the training of hand and eye. At the same time, they all lend themselves readily to the tangible and concrete representation of any new forms which an active imagination may construct; and further, when a concrete representation has in this way been obtained, as, *e.g.*, a new design in drawing, this may form a fresh starting point for higher effort, both of the imagination and of the hand.
5. Models, drawings and diagrams are aids to imagination. They are directly observed, it is true, but they leave much in the way of enlargement, colouring, and other surroundings to exercise the

imagination. The teacher who is ready at presenting the new matter in outline sketches on the black-board will be the first to acknowledge the great assistance this form of drawing is to rapid and effective acquisition on the part of the taught. It is well at times to question the children upon the meaning they attach to a line on a map or on a plan. In order to bring the picture in the child's mind into accord with the object it represents, there is no teaching appliance more effective than the model.

It should be noted that the exhibition of objects, models and experiments may tend to make children accurate observers and at the same time leave the powers of imagination comparatively neglected. Children ought to be frequently directed to watch what is taking place in an experiment (so far observation is exercised and the memory is stored); they ought, however, as frequently to be required to state any appearances they expect to follow certain changes about to be made, and thus be led to anticipate other effects not as yet observed. This effort of the learner is allied to that of an adult who attempts to picture the future, or the scientist who frames a theory; it is of the higher or controlled form of imagination and lends itself to the acquisition of knowledge.

GENERAL KNOWLEDGE: CONCEPTION, JUDGMENT AND REASONING.

A. Conception, or the formation of a 'general notion.'

A child's knowledge is for the most part particular and individual, *e.g.*—the word 'tree' is associated with some individual and familiar example; 'book' is the name of its own reading book; 'house' recalls its own residence; 'animal' is the name of the domestic dog or cat; and so on. To an adult these words are class names which recall no particular examples, but in each case they stand only for the few features common to the entire class, *e.g.*—

'Tree' is neither associated with this or that particular tree, nor with the mental image of any individual tree; the name recalls a growth which has roots, a stem, branches, and leaves. These common conditions of most, if not all, trees form the 'general notion.' The word 'book' ordinarily calls to mind something with leaves folded together, upon which reading matter either is, or may be stated. 'Animal' is an organism endowed with life, and generally with power of self-activity.

The progress of the child mind from the particular knowledge of the infant stage to the general knowledge which it uses in more advanced life is very gradual. The ordinary every-day experience of the child—the result of its association with things surrounding it—is of great service in promoting this progress. The practical questions for us to determine are the following: (1) What school exercises assist in this progress? and (2) How shall we as teachers make these exercises most effective?

Before we answer these questions it may be advisable to make an attempt to distinguish the stages into which the effort of forming a 'general notion' is usually resolved. These stages may be illustrated by a supposed lesson on **'the resembling features of common English trees.'**

(i.) **A group or class.**—The first stage in the lesson is to bring examples of several trees before the minds of the class for their inspection. If in the country, or near a park, children will be able to recall by an exercise of memory certain well-known trees, such as the poplar, the willow, the elm, oak, and apple. Pictures of others may be shown, together with specimens of leaves, bark, and branches.

We make no progress towards the general notion until a group of allied objects has been inspected. The few common features which go to form the general notion are present no doubt in each individual specimen, but the child cannot detect them. We may point them out, it is true, but in doing this, we are robbing the exercise o nearly all its value. The scholar should be led to make the discovery of the common features for himself. It is in this effort of discovery that the intellectual training which the exercise is capable of yielding mainly rests; moreover, the training thus given in connection with a simple lesson on a subject like that of trees may be used afterwards by the child in forming for itself other general notions. How then are we to lead children to make for themselves the discovery of the common features of the group? This brings us clearly to the second stage in the exercise.

(ii.) **Comparison.**—If two of the trees mentioned above are taken, as, for example, the poplar and willow, and subjected to inspection by the class under the guidance of the teacher, it will be found that the class recognises the striking differences quickly enough. The towering poplar will be contrasted with the stunted willow, the differences in the leaves, branches and stem will be readily recognised and stated. Comparison, however, demands the effort to recognise points of similarity between the two trees, and to this exercise the pupils must be guided by the teacher.

In selecting examples for the purpose of comparison, the young teacher must take care that a considerable variety of form exists between the members composing the group, so that a fair amount of effort may be required on the part of the scholars in order to find out the various points of similarity existing in the groups. If, *e.g.*, the elm and the willow are presented to the class for inspection, the common features are not very apparent, and hence considerable effort is demanded in order to find them out. **The amount of effort required to discover the agreeing features in a group bears some proportion to the degree of success with which these resembling conditions are fixed in the memory, and are afterwards retained and recalled.**

Whilst, however, a variety in the features of the individual examples composing the entire group is necessary, care must be taken that these are not so numerous and striking as to completely overshadow the points of similarity. If the palm, the banyan, and the cactus were made examples for class inspection, the pupils might fail to recognise any points of similarity at all between the several members of the group.

(iii.) **Abstraction.**—Success in this exercise of comparison will be found, upon close inspection, to involve two forms of intellectual effort, and these now claim our attention; they are **Abstraction** and **Generalisation.**

The first of these terms is a familiar one in school work. The abstract noun forms the first difficult exercise in the teaching of grammar. Abstract number claims the attention of both learner and teacher in early exercises in arithmetic.

The number *five* may be considered in connection with objects, as five slates, five marbles, five desks, &c. Amidst the varying aspects of the different groups of objects—some square, others round, some made of stone, whilst others are made of wood—the pupil soon learns to identify a similarity in the number of each group of objects. This common condition of the different groups is eventually withdrawn by an effort of abstraction from any connection with the objects themselves, and is then associated with a purely arbitrary sign, viz., the figure 5. When afterwards we say $5 + 5 = 10$, or $5 \times 5 = 25$, we do not associate objects at all with these numbers, hence these are said to be *abstract numbers.*

> Here we may remark, that during this effort of abstraction the exercise is vastly aided by the teacher taking a number of objects having a variation in their outward appearances, as, *e.g.*, five *balls* on a ball frame, five *dots* on a domino card, five *cubes* from Frœbel's gifts, &c. This variation in the outward appearance of the objects is of advantage (1) because of the effort aroused in order to identify the common feature, viz., that of number; (2) because the number five not being exclusively associated with any one of the objects is more readily thought of as separate from any, *i.e.*, *as an abstract number.*
>
> > This truth may be tested by children being constantly taught number from one appliance, such as the ball frame. The number, in this case, is so closely and repeatedly associated with the familiar objects that the balls are referred to whenever the child is dealing with figures, and hence their concrete form is maintained.

Abstraction in forming the General Notion.—The form of abstraction with which we are acquainted in our teaching of arithmetic does not quite agree with the abstraction spoken of in the formation of the general notion. In examining a ball, a dot, and a cube, in order to get the notion of one or unity which each example presents, it is necessary that the shape, the size, and the colour of each should be discarded. The mind must be turned away from these features, which are not common to the entire group, so that the attention may be concentrated upon the idea of unity which all the above examples manifest. This effort of the mind is termed **Abstraction.***

If now we return for further illustration to our lesson on common English trees; the poplar, the willow, the elm, the oak, and the apple tree have

*'Abstraction,' says Professor Sully, 'is the withdrawing of the attention from certain things in order to fix it on others.'

many features which are not common to the group—the height, the colour, and shape of the leaves, the form of the stem, the general shape, &c.; these features do not enter into the common notion, and so long as the attention of a child is fixed on them, the general notion cannot be fully developed. Hence the necessity of banishing these from the mind by an effort of abstraction.

> The best way to banish one set of impressions is to replace them by another set, the other set in this case being those common features which all trees possess. The uncommon features, however, are those which are most attractive, whilst the common or general features are least striking. Here then the teacher's work manifests itself: he will find it necessary (1) to suppress the tendency in his pupils to fix their attention on the striking characteristics of individual members of a group, and (2) to stimulate and encourage them in their efforts to find points of similarity amongst much that is distracting.

(iv.) Generalisation.*—It is difficult to establish the distinction between the process of abstraction, as described above, and that of generalisation; some—H. Spencer, for instance—hold that there is a clear distinction between the two intellectual operations, whilst others as firmly hold that they are essentially the same. So far as teaching methods are concerned it is neither possible nor desirable to separate the two processes. It has already been stated that when the pupil is required to turn his attention from a quality or a set of qualities possessed by some but not by all of a class of objects, he does this best by fixing his attention on the remaining set of qualities, *i.e.*, upon those which are common to the entire group, *e.g.*—

> The marshalling together of the similar features existing between the elm, oak, &c., is effectively done when the striking and distinguishing features of each individual of the group are dismissed from the account. To state the case in another form, we lead our pupils to realise most distinctly the common qualities of growth, roots, stems, branches, and leaves, when size, shape, and other individual but not universal characteristics, are neglected. After the learner has marshalled together the common features of the elm, oak, &c., he *mentally* forms a new notion—the general notion, *i.e.*, he forms a notion of a class of things, each member of which possesses the features thus marshalled together. The learner is then said to generalise. The term 'tree' accompanied by a statement of the assemblage of similar features it stands for, viz., '*an organic growth with roots, &c.*,' is called a **Generalisation.**

Stages summarised.—If now we sum up the stages in the formation of a general notion or concept, we find:—

i. The bringing together of a class of individual and allied objects, each of which must be either present to the senses or be recalled by memory in the form of a mental image.

ii. Comparison, or the search for points of resemblance in the set of objects under inspection.

* The student will find, at times, the words Abstraction and Generalisation used for the entire process of conception.

iii. Abstraction, or banishing from the mind all individual characteristics which, by reason of their being attached to one or only a few of the group, find no place in the general notion, and fixing the attention on the resembling constituents.

iv. Generalisation, or mentally bringing together the resembling constituents of the group and forming the notion of a class of objects possessing these constituents.

(v.) Terms—Concepts versus percepts.—The term *concept* is frequently applied to the group of resembling features possessed by a class of objects. The *concept* differs from the *percept* in that whilst the latter is composed of the group of impressions made by the *different features of an individual object* present to one or more of the senses, the concept represents no individual object, but includes merely the *similar features of a group or class of allied objects.* The *concept* is a purely mental product, and is not dependent upon the presence to sense of any of the class of objects out of whose resembling features it has been formed.

B. School exercises helpful to the formation of the General Notion or Concept.

1. In a reading lesson the following sentence occurs:—'*Grain* is the staple food of the people.' The word grain stands for a *class notion.* This may or may not be in the pupils' minds. The teacher asks, 'What is grain?' 'Wheat,' replies one. 'Yes, wheat is *a* grain, but not *all* grain.' 'Name, if you can, other grain.' In this way the children are led to mention wheat, barley, oats, rye, maize, rice, &c. The question may now be repeated, viz., 'What is grain?' The scholars grow more thoughtful than at first. They have exhausted their list of the things they know to belong to the class grain. The answer to the question is clearly not a particular member of the class grain but some qualities common to the whole class sufficient to distinguish grain from other classes such as fruit, roots, &c. The teacher asks for some quality they (*i.e.*, all the grain), possess. He shows the head and stem of wheat, barley, oats, maize, &c. The scholars soon *see* that in every case the term grain is applied to the seed. They also *know* the seed in each example is an article of food. It may be necessary for the teacher *to tell* 'that the seed is that of a grass.' The question is put again a third time. The children do not now think of wheat or maize, &c. They have mentally put together the notions of '*seeds of grasses good for food*,' and 'Grain' is now the name of *a class of things*, each member of which possesses the common qualities named above. In this way the scholars have had an exercise in **abstraction** and **generalisation.**

2. A class of young children is asked the meaning of the word 'animal.' In reply, one child says *cat*, another *dog*, &c. These answers show that the word is associated with particular objects, and that the full general notion has not as yet been formed, or if formed, the class is unable to

put the notion into language. The teacher at once proceeds to explain: 'Yes, cat and dog are names of animals, so are bird, fish, snail, and frog.' The scholars have now a group of objects before them, and the first step towards the formation of the general notion is taken. After a moment or two of reflection the question is put again, and the most likely reply is, 'Anything with life.' This answer is the result of comparison, thus showing that another step towards the formation of the general notion has been taken. The first answer erred in being too narrow, the second is in error in being too wide.* The teacher must now, by a third effort, attempt to fix exactly the limits of meaning to the term 'animal.' 'Yes, an animal,' he says, 'is a thing with life, so is a tree, it lives and grows, but is not an animal.' After reflection and some guidance from the teacher the pupils may be led to a general, if not absolutely scientific distinction between the two forms of life. The original question is now repeated, viz., 'What is an animal?' In reply a scholar may now be expected to say, 'Anything alive and able to move where it pleases'—an answer sufficiently exact for the present. Before being able to formulate this answer, however, the pupil must have turned his attention from the particular and distinguishing qualities of the individual objects before him and have concentrated his thought upon those common and resembling features which form the general notion or concept. The word 'animal' in this way becomes associated in the child's mind with a class of things possessing the qualities named above.

The exercises just sketched are samples of teaching used frequently by the teacher, and it is not difficult to sum up the methods adopted, and to connect these with the principles underlying them. There have been (1) the *grouping* of examples; (2) the effort of the children to find the similar features in the group (*comparison*); (3) the recognition by contrast, and the withdrawal by *abstraction*, of the features not necessary to the general notion; and (4) the shaping into a statement of the similar features forming the general or class notion (*generalisation*).

The young teacher is to be congratulated who finds pleasure in devising means for leading his pupil to the required knowledge by methods thus firmly grounded on the principles of science. Such a teacher will frequently be startled by finding a child able to give the correct answer almost immediately the first question is put. On enquiry, however, he will most likely find that a glossary at the top of the lesson or at the end of the book has supplied the answer. In this case the information is given by the child, but the knowledge has not been obtained, nor has the child undergone those intellectual exercises which are even of more value than the acquired knowledge.

* Every general term, such as 'animal,' has a twofold meaning. (i.) It is the name of a class of objects; (ii.) It stands for certain qualities possessed by all the members of the class. The first of these meanings of a general term is called its *Denotation*, or **Extension**; the second is its *Connotation*, or **Intension**. The answer 'cat' to the question 'What is an animal?' is too narrow in denotation only; if its connotation be taken into account then the answer would be too wide. The connotation of the term 'animal' is set out in the final answer of the class, viz., 'Alive and able to move at will.'

From indistinct to clear.—This is an old maxim which is frequently stated in text-books on teaching, and which finds apt illustration in the above example. The term 'animal' was first connected by the child with a particular form of the group, say, cat. Now the general notion (*i.e.*, life and movement at will) is composed of qualities both of which are possessed by the animal named, but they are so enshrouded amid a host of other features that they do not stand out distinctly as the features essential to the class animal. When examples, however, are multiplied, their common and essential features become gradually more and more distinct, and the final answer of the pupil indicates clear knowledge as having taken the place of that which was at first indistinct.

Other lessons helpful to the exercise of conception.

If the value of the explanation in a reading lesson for the purpose of forming general knowledge be recognised, there will be no difficulty in seeing at once that the same series of intellectual operations will be manifest whenever (1) *objects*, as in elementary science, (2) *words*, as in lessons on the parts of speech, and (3) *phrases* and *sentences*, as in the analyses of sentences, are made the subject of our teaching.

Object Lessons.—Except in the classes for the youngest children, lessons upon objects should be arranged in a logical series, so that the material presented in the series admits of classification. Then the several intellectual operations of comparison, abstraction, generalisation, and statement, necessary for the formation of the general notion, are brought into exercise with the least effort and the most encouraging results.

The Grammar Lesson.—Early exercises in grammar consist mainly of the grouping of words into classes called parts of speech. Here the learner, instead of using things, as in the above exercise, deals with words. These words either are, or should be, quite familiar to the pupil, and when this is the case the operations of comparison, &c., can be readily performed. Words, either as they are retained in the memory or read in a book, can be produced much more easily and quickly than groups of objects. It is largely upon the facility with which words and phrases become available for the exercises of comparison, abstraction, generalisation and statement* that the usefulness of grammar as an intellectual exercise rests.

The intellectual operation is the same whether we take the classification of words in the parts of speech or the classification of sentences and phrases in analyses of sentences. The question of priority in these two grammatical exercises cannot be determined from their intellectual aspects. Both require the

* This series of terms is repeated here because it sets out the intellectual operations explained in previous paragraphs. The young teacher must not be surprised to find other words used for the same operations, as, for example, comparison, classification, and the establishment of general rules and definitions.

operations of comparison and classification, and both lead up to the establishment of general truths (definitions, rules, &c.), and but for the difficulty which young pupils experience when terms are multiplied unnecessarily, the two operations might very well be taken together.

The Geography Lesson.—Matters of fact such as the positions of places, the names of geographical features, the productions, industries, and population of localities, these do not lend themselves readily to arrangement except so far as their association is helpful to memory. Only in the following exercises, respectively, does geography lend itself seriously to the formation of general knowledge. Geographical terms, such as *river*, *mountain*, &c., represent general knowledge, and must be learned in the same way as the terms 'noun,' 'animal,' &c. ; then, again, the study of physical geography requires the classification of facts and the establishment of general truths and laws by the operations of comparison and generalisation.

Conclusions.

From a review of what has been stated in this chapter, the following general conclusions are apparent :—

1. That there is a considerable advance in intellectual effort from the previous stage of Perception, Memory and Imagination to that of Conception, or the formation of the general notion.
2. A comparison of the operations, ranged under those of Observation, Memory and Imagination on the one hand, and of Conception on the other, has led to the following division, viz. :—
3. Observation, Memory and Imagination are in close association with actual objects—Observation requires the presence of a thing ; Memory is most frequently the recovery of an image by association with some object or word, whilst Imagination is largely the transformation of these images. Hence intellectual operations up to this stage are termed **Concrete** and **Particular.**
4. The Concept, on the other hand, whilst it results from a consideration of a class of things, does not associate itself with any one thing. So long as a name attaches to, or so long as it calls up in the mind, any individual image, the effort is memory, and only when it is associated with a typical result, and one which has no existence except in mind, does the effort become conception. Knowledge in this form is termed **Abstract** and **General,** and the intellectual operation by which it is obtained is expressed by the term '**Thought.**'

JUDGMENT AND REASONING.

Introduction.—

The young teacher must not be afraid of these high sounding terms ; they are expressions used for operations with which he is already familiar in school experience. The exercise of the powers of judgment and reasoning, when examined and properly understood, will be found to involve very little that is new ; in fact, if the process by which a child's particular knowledge is converted into general knowledge has been thoroughly grasped, the intellectual operations of judgment and reasoning will be very readily understood.

Examples of the exercise of judgment in ordinary school work.

First Example.

In previous lessons the general notions we possess of some parts of speech have been explained, and the method by which they are established has been stated. If now a new word, say 'canoe,' is presented to the class, and a child is asked to state the class of words (part of speech) to which it belongs—the pupil reflects for a moment ; during the pause he is mentally busy examining the use of the new word. Does it denote a thing or an action ? The decision is recorded when the child says 'a noun.' The full answer would be 'The word canoe is a noun.'

Here are all the essential features of the intellectual operation of judgment. When the process is analysed, there will be found to be the exercise of **comparison,** for the new word is brought into comparison with the general notion already formed of the class *noun*, and with that of the class *verb ;* it agrees with one, viz., the noun class ; it does not agree with the other class, viz., that of the verb ; the child now **chooses** the noun class as the one to which the new word belongs, and the reply given in answer to the teacher's questions announces the result of the double effort of **comparison and choice.**

Comparing and choosing are the main elements in the act of judgment.

Second Example.

'London is a city' is given in answer to the question, 'What is London ?' Here the class name is city : the common qualities forming the general notion being, (1) many inhabitants collected together, (2) the centre of a bishopric, whilst size, situation, character of people, their occupations, &c., are found to be varying conditions, *i.e.*, they change with every example.

Now, with the two common qualities summed up as forming the *connotation** of the term city, London is mentally compared, and the result of the comparison is that agreement is recognised and is expressed in the statement 'London is a city.'

If the general notion of a village be taken, and London compared with it, the result would be disagreement between the two notions.

Here again we have the intellectual operation of comparison, with the result that in the first case agreement is established between the two notions compared, whilst in the second disagreement is the result.

Whenever we thus compare, and as a result of our act of comparison are able to assert agreement or disagreement between two notions, **the intellectual operation is that of judging.**

Kinds of judgments.

The above are very simple forms of judgment; advance is manifest, when from the comparison of single notions, as, *e.g.*, 'Victoria is Queen of England,' the pupil proceeds to compare single with general notions, as, *e.g.*, 'the Thames is a river.' Still further progress is evident when general notions are compared with other general notions, as, *e.g.*, 'dogs are faithful creatures,' 'planets are heavenly bodies.'

Such simple judgments as the first named are made by very young children. 'This paper is white' is a judgment which the youngest child will understand without effort: it and all similar judgments are sometimes termed *intuitive*. A considerable advance in information is necessary before the pupil can, unaided and with certainty, form judgments which are the result of comparing general notions. It is evident that the latter effort must be subsequent to the power of conception. When, however, these higher judgments are formed, they prepare the way for more advanced intellectual effort, as when from the example quoted above, viz., 'planets are heavenly bodies,' the pupil proceeds to the *inferred* or *reasoned* judgment that 'some heavenly bodies are planets.' There are thus three stages of the intellectual act of judgment clearly marked, viz. (1) **the intuitive,** (2) **the judgment resulting from comparison and choice,** (3) **the reasoned judgment.**

Immature judgments and their treatment in teaching.—Children at a very early age almost startle us, at times, with statements which appear to indicate a ripe form of judgment; it will frequently be found, however, in these cases that the statements made are those heard from others, and are therefore simply imitations of those expressions. The teacher

* See foot-note on page 55.

who hears a scholar state that 'metals are elements,' for instance, would most likely test the child's statement by such questions as the following: 'What is an element?' 'Name metals which are elements.' It might be found that the child had no satisfactory knowledge of either elements or metals. In such a case the expression is simply either a repetition of what the child has heard or read, or, if its knowledge of an element is satisfactory, it has arrived at the full expression upon the slender knowledge of one metal, iron for instance, being an element.

The teacher who can at once probe the amount of knowledge upon which the statements of children are based, and do this without humiliating the pupil, does the scholar a real service. This is especially the case when the feeling of enquiry is aroused and the habit of cautious statement is developed.

'Verbs express action' is a common answer to the question, 'What is a verb?' The answer is right as far as it goes, but after a fuller examination of examples the pupil finds it necessary to add to the notion of 'action' those of 'being' and of 'suffering.' Judgment in this case has been exercised before a sufficiently wide basis of examples has been submitted to the pupil. The pupil in such a case as this should be commended for his effort—it is correct so far as his knowledge serves; the teacher's tact is manifest in at once recognising the defect in information and in immediately supplying the examples by which the scholar is able himself to extend his statement and correct his mistake. There is no loss of dignity on the part of the child in this effort, for whilst the mistake has been recognised, his own effort has led to its correction, and at the same time the following valuable lessons have been taught, viz., **(1) Not to rush into statements hastily; (2) That general statements can be depended upon only when based upon a wide area of examples.**

Another and very different treatment is sometimes practised, *e.g.*, after the scholar has stated that 'verbs express action' the teacher says 'no' and passes to a more clever pupil for the full and correct answer. The boy who answered first, and all in the class like him, have been corrected but not taught. They have been led to feel that their knowledge is not to be relied upon, but the mode by which their incomplete knowledge may be made full and accurate has not been shown. They are ignorant and they know it; when the next question is put they hesitate to attempt a reply, and thus throughout the lesson a wrong method stunts intellectual effort and bars educational progress.

Sufficient has been now stated for the young teacher to understand the nature of the intellectual operation termed Judgment. He will find in his teaching that he is constantly exercising the power himself and encouraging its exercise in his pupils. His method of teaching will invariably be sound if he leads children to form judgments by their own effort, and

does not seek to impose the judgments of others, or even his own, constantly upon them. They need to accept with the humility becoming their tender years the judgments of others which ages of experience and thought have stored up; at the same time, we, as teachers of youth, need to set ourselves, whenever a good opportunity presents itself, to guide our pupils along the path by which sound judgments are formed. In this way we prepare them for the proper reception of knowledge as it has been formulated by others; at the same time we put them in the way of adding their share to the accumulated store; and, most important of all, through this process of training we ensure that higher intellectual exercise which should be the aim of every teacher of youth.

Judgment in relationship to earlier intellectual operations.

One of the most fruitful exercises for a teacher is to try to establish the relationship which exists between the different operations of intellect with which he becomes familiar. In the effort he may at first find considerable difficulty, but the exercise will serve two purposes. (1) It will show him where his knowledge is defective; (2) it will serve to bring out with distinctness the knowledge he has gained.

1. **Judgment and Conception.**—In each of the given examples of judgment it will be seen that one or more of the notions is a 'general notion.' This is almost the invariable condition of all judgments. It is true that judgments with single notions alone may be found, as, *e.g.*, Victoria is Queen of England. These, however, are very rare. If, then, the 'general notion' (concept) enters into most exercises of judgment, it becomes very necessary that the pupil should be capable of forming a concept before any serious exercises of the judgment be attempted. Hence conception very naturally precedes judgment. At the same time, it will be remembered that the first stage in the formation of a 'general notion' (concept) is to form a group of objects, or of images of objects, having one or more common feature; *e.g.*, after the first crude notion of a plant is formed, the addition of every fresh example to the group represents an act of judgment. This thing found growing in the ground, though never seen before, is put into the group of plants because it has many, if not all, the features already seen in other members of the group. Each such addition of individuals to make up the class is added by an act of judgment. Many such additions are necessary before a clear and distinct 'general notion' (concept) becomes manifest. Hence a simple form of judgment is necessary to the formation of the concept.

2. **Judgment and Perception.**—All our direct knowledge of external objects is obtained through the medium of one or more of our senses; they are said to be 'the five (?) gateways of knowledge.' The process is briefly this: *e.g.*, an object reflects light from its surface, the light enters our eyes, and we become, in some way not understood, aware of the effects of this light upon the eye and upon the nerves and brain structure associated with it. If we close our eyes the object is not seen; if our eyes had never been opened the object would be unknown to us. Seeing the object, then, simply means that we become *aware* of a change which occurs in the nerve structures. In time we learn to associate the change of feeling with certain individual objects. Now the act of distinguishing the changes in feeling, *i.e.*, a present state from one preceding it, and the recognition of the recurrence of the same state—these are both crude forms of judgment.

3. **Judgment and Imagination.**—The imagination of a little child is largely uncontrolled. It pictures objects in the dark, and becomes afraid; by its fancy it converts its playthings into images of things the most unreal, and it manifests the greatest delight in these creations of its own imagination. Afterwards, with the increase of knowledge, it becomes capable of deciding between what can and what cannot be; and now, whilst imagination is not less active than it was in child-life, it has become regulated chiefly by the growth of knowledge, and by the exercise of judgment which this increase of knowledge makes possible. In this way judgment becomes the most effective means of regulating and directing the imagination.

REASONING—I. INDUCTIVE.

Introductory.

It has been shown that by a comparison of two notions we arrive at a statement which expresses a judgment, as, *e.g.*, when we compare gold with element an agreement is established and expressed in the statement 'gold is an element,' or when we compare a particular oak tree with evergreens, agreement is not established, and the result of our comparison is found in the statement that 'this oak is not an evergreen.' The statements 'gold is an element' and 'this oak is not an evergreen' are expressive of judgments.

Now these judgments are arrived at immediately by taking in each case an individual instance and comparing it with a class, and in one case establishing directly an agreement between the individual and the class, and in the other case disagreement. The intellectual effort therefore in both cases is

judgment, and so far they only illustrate what has been taught in previous chapters. When, however, we have accumulated other examples and established the truths, that the metal iron is an element, and that silver is an element, and that lead, copper, aluminium, sodium, &c., are all elements, we are soon ready to state of all metals that 'they are elements.' The statement 'all metals are elements' sums up a great many individual truths, each of which existed originally as expressive of a simple judgment. The statement does more, however, for should a new metal be added to our list, it expresses knowledge of this also, viz., that 'it is an element.'

Now the truth 'all metals are elements' is not arrived at fully and completely by simply comparing a particular metal with the class notion of element; on the contrary, it is arrived at by comparing a number of separate judgments so formed, and is hence a *universal* truth or judgment arrived at from the comparison of, and the established agreement amongst, many individual truths or judgments. These **universal judgments** are formed by a process of reasoning termed **Inductive.**

Inductive Exercises in School Work.

1. *The Grammar Lesson.*

(*a*) The following sentences are first written on the blackboard :—

(*a*) **John** swims well. | (*c*) **The servant** is faithful.
(*b*) **The dog** barks loudly. | (*d*) Merrily sounds **the horn.**

In answer to questions it is stated that the word John belongs to the class *noun*, it is of the *nom. case*, it also answers to the question who? The words dog, servant and horn are similarly treated. **So far judgment has been exercised.**

(*b*) The next stage in the inductive process is to collect the individual judgments or truths into one statement, viz., 'that the words John, dog, servant and horn are (1) nouns, (2) in the nom. case, (3) they answer to the questions who? or what?'

(*c*) The term which in future is to sum up the three truths stated above is supplied at this stage, viz., **the subject of a sentence.**

(*d*) The final stage is to set out the general truth or universal judgment, viz., 'that the subject of every sentence is a noun (or expression equivalent to it) in the nom. case, and answering to the questions who? or what?

The statement under (*d*) is sometimes termed a *principle*, sometimes a *rule* and sometimes a *definition*. Now whilst the name we give the statement is liable to variation, the movement of the intellect is the same for every case. It is from the consideration of individual examples to the establishment of a principle, a rule or a definition. **The term used for this form of mental effort is Induction.**

2. *A Truth in Physical Geography taught inductively.*

Examples:

1. The mountain range running in the direction of the greatest length of Great Britain is very old, it is also low and very metalliferous.
2. In America the Alleghany mountains run generally from N. to S. They are old, low, and very metalliferous.
3. In Europe the mountains of Central Germany and Bohemia are generally north and south in direction; they are furthermore low, and rich in metals.
4. The Oural mountains between Europe and Asia run almost directly north and south; they are low, and remarkably rich in metals.

The student of geography whose attention has been drawn to this succession of individual truths is now ready to accept as a general truth the statement 'that when a mountain range is found to run in a north and south direction, and is also low, it will in most cases, if not in all, be rich in metals.' **This law of physical geography is an induction. It is arrived at by the upward progress of our thought from the investigation of individual facts to the establishment of a general truth.**

3. *The rule of equal additions in Subtraction.*

(*a*) Examples:

i. $5 - 2 = 3$ | iii. $(5 + 7) - (2 + 7) = 3$
ii. $(5 + 2) - (2 + 2) = 3$ | iv. $(5 + 10) - (2 + 10) = 3$

(*b*) The comparison of these individual examples and its results.

(i.) When the number 2 is added to minuend and subtrahend, the difference between them is not altered.

(ii.) Similarly when 7 is added and (iii.) when 10 is added.

(*c*) The *rule* or general truth established inductively, viz.—

When the same number is added to both minuend and subtrahend, the difference between them is not altered.

The three general truths just established are inductions arrived at from a comparison of a number of particular instances. In school work the inductive method of teaching is frequently available, and especially in the following lessons:—(1) the rules and definitions of grammar; (2) the rules of arithmetic; (3) the principles of science.

In giving a lesson upon any of the above topics it is much easier to state the general truths and afterwards to supply illustrative examples. In this way the pupils may in time be enabled to understand the truth told them by the teacher. But the truth in all its fulness is not realised at first, and only after many examples have been supplied does the rule or principle become clearly and fully known. The inductive method, on the other hand, does not begin with the statement

of the definition or the rule. These are placed at the end of the teaching process, and instead of being announced by the teacher are formulated and stated by the pupils. For this reason the inductive method has received the name of the **Discovery** or **Heuristic Method.**

Immature Inductions.—The young teacher must be quick to detect and as ready to correct the faulty inductions which pupils often make. In Grammar, for instance, because the noun in the nominative case very frequently precedes the verb, and this fact is seen in nearly every reading and parsing lesson, the learner is very apt to conclude that the subject is the noun, or other word immediately *before* the verb, and similarly that the object is the noun immediately *after* the verb. The tact of the teacher will be manifest in the care with which he selects and arranges his examples so that this mistaken inference cannot arise.*

Again, in teaching the Coast-line of Western Europe the repeated association of the remarkably indented western coasts of Ireland, England, Scotland and Scandinavia with the proximity of the Atlantic Ocean misleads many learners of geography into the notion that great oceans cause indented coast lines. More examples are needed in this case; *e.g.*, Africa on three of its sides yields contradictory evidence; Australia and South America do the same on all their sides. Fuller knowledge of the Atlantic sea-board of western Europe shows that the indented nature of the coast is due to the variations in the height and hardness of the adjacent rocks—the low and soft rocks wearing away more rapidly than the bold and hard rocks. Hence the latter form the mountain ridges on the mainland, and the bold headlands on the coast. The remedy for hasty and immature inductions is:—(1) **To give plenty of examples.** (2) **To see that they are thoroughly understood.** (3) **To lead the pupil to correct his fault either by the examination of further examples or a more thorough inspection of those already supplied.**

Inductive Reasoning and Conception.—So far as intellectual operations are concerned it is evident that inductive reasoning and conception have very much in common. Both exercises require the effort of comparison—viz., of things in conception; of truths in inductive reasoning. Conception leads to the formation of the general notion, inductive reasoning to the formation of general or universal truths. It was seen in the process of conception that generalisation was the bringing together, mentally, of a class of things on the ground of their similar features; induction is also the discovery of similarity in the relations which things and truths bear to one another. Because of this likeness between the two intellectual processes the term 'generalisation' is sometimes used for the *final operation* in forming the concept, and sometimes used for the *entire process* of induction.

* See the examples in the Grammar lesson sketches.

These higher powers are very closely related to all the preceding intellectual operations, as well as to one another. The recognition of similarity is a condition of perception, and it is one of the chief forms of association in memory. A main difference, however, between the higher and lower intellectual efforts is the pre-eminent position which the recognition of similarity holds in the higher exercises, whilst differences, distinctions, and contrasts, are the most effective exercises in the lower intellectual operations.

REASONING—II. DEDUCTIVE.

Introduction.

In the preceding chapter we have learned how the method of induction enables us to establish general truths; we now go on to make use of the knowledge thus gained. The following truths were established by the process of induction, viz., (1) 'All metals are elements'; (2) 'The subject of every sentence is a noun (or expression equivalent to it) in the nominative case, and answering to the questions who? or what?'; (3) 'Mountain ranges running north and south, which are also old and low, are rich in metals'; (4) 'When the same number is added to both minuend and subtrahend the difference between them is not altered.' These general truths become now available for the establishment of new truths in the following way:—

Examples of Deductive Reasoning.

i. A rock specimen is submitted for inspection; it is determined to be a metal; as soon as this is discovered, without further investigation we state *that this newly found metal is also an element.*

ii. A sentence from a new author is being analysed—the portion of it which stands in the nominative case, and which answers to the questions who? or what? is separated from the rest of the sentence, and as soon as this is accomplished the pupil without hesitation announces *this portion of the sentence to be the subject.*

iii. The geography of a new country—say New Zealand—is being taught, and the direction and character of the mountain ranges are under discussion. As soon as a class possessing the general truth named above finds that the mountains of New Zealand run generally North and South, and, further, are old and well denuded, they will most likely enquire whether these mountains *are not rich in metals.*

iv. A class working an example in subtraction such as the following :—

$$\begin{array}{r} 13\,7^{10} \\ 2\,\overline{1}9 \\ \hline 10\,8 \end{array}$$

will not hesitate to add 10 to 7 so as to be able to take 9 from 17, and proceed to add one, *i.e.*, 10, to the figure 2 in the subtrahend, and accept 108 thus obtained as the correct result.

What the examples teach.

In each of the above cases there appear at first glance to be but two truths before the mind of the pupil; upon closer inspection, however, it will be found that the scholar mentally appeals to a third, and that the general truth. In passing from the truth 'this rock specimen is a metal' to the inferred truth 'this metal is an element,' there is a mental reference to the general truth 'all metals are elements.' This is not stated, but if the question 'Why do you say this specimen is an element?' be put, the pupil answers, 'Because all metals are elements.' Similarly, in answer to the question, 'Why do you place that portion of the sentence in the subject?' the pupil for answer states the general truth, 'Because the portion of the sentence standing in the nom. case, and answering to the questions who? or what? is always the subject of the sentence.' 'Why do you think the mountains of New Zealand are metalliferous?' 'Because of their direction, their age and height.' We learn therefore in the simple forms of deductive reasoning examined that every such form of reasoning includes three truths, one of which is a universal statement and often not expressed. The new or inferred truth is called the **Conclusion.** The other two truths are termed **Premises,** and the complete form of argument is termed a **Syllogism.**

It is an excellent discipline in class teaching frequently to require children to set out in words the grounds for their statements, for by this means only can a teacher be sure that the children are exercising their powers of reason. This method helps to correct the tendency in children to guess, and to form hasty and unwarranted conclusions. A teacher who desires to exercise the reason of children as well as to supply them with information, frequently stops to enquire **why?** In arithmetic the question is 'Why do you do that?' In grammar, 'Why is this the subject?' In geography, 'Why do you think so?' In science, 'Why does this follow?' Unless the question 'why' has been preceded by careful training in the establishment of the general truth to which it refers, it leads children to reveal their ignorance, and the shallow nature of their previous teaching. In this case their replies become mere guesses, the teacher becomes discouraged, and he

avoids such trying questions in future. Hence it appears that the question 'why' frequently put and correctly answered is at once the best of tests of sound knowledge on the part of the pupil, and of skilful direction on the part of the teacher.

Inductive and Deductive Reasoning compared.

We are now in a position to determine the difference between these two methods of reasoning. In inductive reasoning the pupil is led to establish general truths from a comparison of individual truths. These general truths are sometimes termed universal judgments. 'All metals are elements' is a form of such truth or judgment. When a universal truth, such as the one quoted above, has been reached, other and particular truths may be seen to arise therefrom, as, *e.g.*, from the general truth 'all men are mortal' we at once infer that the people recently discovered in Central Africa, and whom we have never seen, are nevertheless 'mortal.' Reasoning, in the first case, is from individual instances, facts, and truths, to general and universal truths. Deductive reasoning, on the other hand, is from a universal truth, rule, or principle, to individual instances or truths with which it is associated. The deductive method is sometimes termed the 'method of instruction' or the 'dogmatic method.'

What method shall we pursue in teaching?—the method of Discovery (*Inductive*) or the Dogmatic (*Deductive*)?

The **Discovery Method** (*Inductive*) is slow. It does not avail itself of truths gained by others and stored in the general principles they have formulated. It is interesting because it calls into exercise our natural aptitude to formulate general truths. It not only exercises this power, it develops it, and by it, further, the pupil has the satisfaction of finding knowledge for himself. It is a gradual advance of the pupil from processes of observation and experiment to the establishment of general and universal truths; and in this progress there is nothing to unlearn; the disappointments arising from error are not experienced; the feeling that exact and full knowledge *may* be acquired is engendered; and above all, the mind is trained to acquire as well as to receive, and by the process power is developed and made available for higher and self-directed effort.

It has been stated that elementary science, grammar, and explanation of the rules of arithmetic, are subjects yielding exercises in inductive teaching.

The **Dogmatic** (*Deductive*) **Method**, or *Method of Instruction*, starts with the general principle or universal truth either expressed or understood. This, when first announced to the pupil, is often not fully grasped; hence so far as it is vaguely accepted by him it is received on the authority

of the teacher, and when this partially understood truth is used, it is frequently erroneously applied, and thus wrong associations are formed, which afterwards need correction. A feeling of uncertainty in the power ever to have reliable knowledge is thus created. In time, however, by the accumulation of examples, the principle or rule becomes clear, and its application certain.

The application of the principles of arithmetic, and the laws of science, and the truths and definitions of grammar in parsing and analysis, and the gradual unfolding of the meaning of general terms from their connection in oral speech or written language, are exercises in deductive teaching.

Conclusions.

A combination of the two processes indicates the true method. The mind is evidently capable of arriving at general knowledge by both processes. The first method is frequently best where a trained teacher is available to direct his pupils *along* the path of acquisition without placing him in absolute possession. The second is often the only available method, especially when school days are over. It is, hence, a duty to accustom our pupils to the right use of the latter method. We do this when we train them (1) to accept the knowledge stored in the general principles and truths obtained by others, and (2) to submit them to tests wherever instances arise which these general truths include.

Reasoning from Analogy.

In the examples of reasoning already submitted the full and complete operation is seen to rest upon the similarities and common relationships which a class of truths presents; when, however, two individual countries are compared, as, *e.g.*, England and New Zealand; they are both found to be islands, they are nearly in the same latitude, both have a fertile soil, and similar climates—from these similar conditions the colonists inferred that objects which grow and thrive in England would also grow and thrive in the colony. Reasoning in this fashion, the English colonists have taken out the grains and trees which grow well in England, and have introduced them with success into New Zealand. The reasoning in this case is from analogy. Again the earth bears evidence of having existed in a highly heated condition, probably in a liquid if not in a gaseous state. The sun is in such a highly heated state now. Both move in the same direction. They agree very closely in the elements composing them. May we not *go a step further and say they have a common origin?* This is argument from analogy.

When in any two examples there are many agreeing features, it may be inferred that they will also agree in other features not yet determined. **The value of the inference from analogy depends upon the extent of the resembling features already determined.**

FEELING AND WILL IN RELATION TO SCHOOL WORK AND DISCIPLINE.

Relation of Feeling to Intellect.

We have seen that the earliest mental conditions are those of feeling; that it is in changes of feeling that sensations arise, and also that when these changes of feelings are associated with external objects, our sensations become perceptions, the vividness and value of these being largely affected by the amount of interest (feeling) awakened at the time of acquisition. We have further experienced the value of a heightened feeling in rendering our impressions permanent and readily recoverable, and in this way assisting the memory. Imagination led by feeling is the early form of the power. It is indulged in by children and leads them to revel in the wildest fancies. Afterwards, imagination becomes somewhat restrained by the knowledge of what can, and what cannot be; still, even in its mature form, the new combinations of the imagination are more perfectly realised when a certain amount of feeling is aroused.

As we advance to the higher operation of intellect, feeling, which has been seen to play a most important part in early education, subsides, and now the intellectual powers become more pronounced. A child under excitement is rarely able to work its sum correctly. At the same time, school work should be associated with a moderate amount of pleasurable feeling, *e.g.*, (1) there should be a healthy and vigorous body, (2) fresh air, (3) exercises which have some charm of novelty, (4) a change of lesson before the work becomes wearisome, (5) the excitement of success, and (6) emulation. All these are legitimate forms of feeling which, when they accompany intellectual effort, render it more effective.

A pupil works willingly when the effort affords pleasure, he will also work diligently in order to avoid discomfort. Intellectual activity is thus seen to be closely associated with feeling. By preference we should seek to stimulate to activity by means of pleasurable associations and only resort to painful associations when the former fail. Pleasurable associations may be said to depend upon the following conditions:—

i. That the exercise of any power we possess yield pleasure.

ii. That the effort be not prolonged to the point when weariness becomes evident.

iii. That there be change and variety of exercise.

iv. That the regular sequence of effort each day at a certain time give pleasure. This takes the nature of habit, so that to follow a set course of action becomes pleasant (*one value of time tables*).

Different feelings to be utilised for discipline at different school ages :—

1. In *very early school days* our pupils appear delighted with the presentation of any novel object. Its outline or its colour attracts, and they willingly concentrate attention upon it. Sense feelings are mainly in operation here.

2. In *later school days* we utilise the feelings of **rivalry** by the prize and mark; it may be we sometimes work upon either the feeling of **fear**, or the desire to gain **praise** and **approbation**. These are distinguished as the *Personal Feelings*, because they have no necessary relation to others, and are merely indulged for personal ends.

3. *The highest feelings* available in school work are **sympathy, sense of duty** to teacher and parents, and **love of knowledge**. These should manifest themselves in the higher classes of our schools, and should gradually displace the lower or personal emotions.

How can the progress here stated be utilised for training and discipline?

This question opens out a most important feature in the discipline and training of our classes. If training is to be in accordance with the progress of feeling which is manifest in pupils at different stages of their school career, it is evident that the treatment must vary with the school period. In infant school age we must utilise the sense feelings mainly. Objects must be made attractive, the surroundings of children must be made as agreeable, as novel, and as beautiful as possible. When the personal feelings become available we may utilise these—rewards, marks, approbation, censure, all become of service now; care, however, must be exercised not to use them exclusively; still higher motives must replace the reward, the mark, and the censure—we cannot always be administering these, and it becomes necessary that children should in time begin the exercise of regard for others. The word 'sympathy' covers the class of feelings now in view. Regard for the teacher should be manifest, and not simply to gain his approval as a reward for action. The pupil's action should be shaped so

that there is sacrifice of inclination on his part in order to satisfy the teacher. These higher emotions are not developed if we continue too long and too exclusively the associations of reward and of mark with everything the child does. Gradually weaken, therefore, this latter form of stimulus by developing the higher and non-personal feeling of sympathy. Finally, no child should pass through the entire range of elementary school life without an effort on the part of the trainer to develop the highest of emotions, viz., sense of *obligation*, of *duty*, and *love of knowledge* for its own sake. These, when developed, and especially if rendered habitual, will go with the pupil when school days are over. They will influence him rightly when he takes his place amongst his fellows as a citizen.

The Will in relation to school work and discipline.

There remain for us briefly to indicate what this expression —the will, means in school discipline and work; and when this is established, to notice the best conditions for its healthy development. Whenever we act so as to effect a definite result, there is the exercise of will. At first the child appears lacking in this power; work, with it, is almost entirely due to some external stimulus, such as the novelty of the object under discussion, its brilliant colour, and the way in which the teacher presents it. Any or all of these may command the effort of the infant. Contrast the state of the child thus described with the youth at home during the evening hours setting himself to work out an exercise in geometry mainly for the sake of the pleasure which successful effort affords. All external stimulus in this case is distant; the youth has left school; there is no distinction to be gained the following morning in the eyes of his fellows by the correct solution of the example. The stimulus is now acting from within—a delight sufficient to satisfy the youth and to spur him on to further work, arising from successful exercise. Effort in the form of attention in the first of these examples is said to be *involuntary*, whilst in the latter it is *voluntary*.

The latter condition is evidently the desirable state to which our discipline and training should raise our pupils. How shall we attain this end? The order in which feeling as a stimulus to activity develops will help us to solve the problem

Feeling and Will.

Feelings have already been seen to range themselves in different grades, viz.:—(1) Those of sense, mainly manifest in the infant condition; (2) these are supplemented by the emotions, classed under the term personal (hope, fear, rivalry, approbation, censure, &c.); (3) the non-personal emotions become available—sympathy and duty; (4) a desire for knowledge and the delight of acquisition.

The young teacher will find that each group of feelings becomes available as stimulus to action, but at different periods of school life. The infant teacher does not appeal for effort on the ground of a feeling for knowledge; on the other hand, it is weakening to a child in the upper classes to be constantly stimulated to effort by appeals to the sense feelings and the personal emotions. Our training, to be complete, must be progressive:—

i. In *Infant Classes* make appeals largely to sense feelings, and do not waste time and effort in appeals to sympathy, duty, love of knowledge and the higher feelings which do not exist. Lessons here must be brightened by the frequent presentation of actual objects. The systematic exercise of the senses is the most legitimate of school efforts at this age. Lessons must be short. Pleasant and agreeable changes and interludes must be frequent, and the teacher must be always present.

ii. *Children up to the ages of nine and ten*, working in classes, manifest mainly the personal emotions, and these may be utilised largely up to this age. Marks, taking of places, prizes, praise, and censure are natural appeals to effort at this period of school life. As our object is gradually to weaken the external stimulus, and thus prepare our pupils for the operation of the higher feelings, there should be a gradual removal of the stimulus from a too close connection with the work of the moment. Marks given after every lesson might slowly give place to marks for each subject at the end of the day, the week, the month. The fortnightly examination for places is a legitimate exercise at this stage. As a stimulus it is sufficiently near to be effective, and at the same time it is not an immediate influence upon the pupil's mind in every lesson to the exclusion of other and higher motives to effort. Scholars at this stage may, within certain carefully ascertained limits, be exercised in independent work. Home lessons, moderate in amount, and forming a revision of previous teaching, form a useful training, inasmuch as they call forth effort apart from the immediate influence and direction of the teacher. At times, during actual school hours, the class, or some portions of it, should be allowed to enter upon self-directed work.

iii. *In the Upper Classes* the adventitious stimulus to action referred to above, whilst it cannot entirely and immediately be dispensed with, should as far as possible be replaced by the higher incentives to action. The higher feelings of sympathy for others, a sense of duty, and a love of knowledge manifest themselves very slowly, and as incentives to school work do not, in many cases,

present sufficient growth to be largely utilised. Very few teachers, however, can have been in daily contact with pupils from the infant stage to the age now under consideration without sharing in the stock of esteem for others which every pupil possesses. His scholars at times surely work from a sense of obligation, and often they are prompted to apply themselves because of the pleasure which they see knowledge affords others, as well as for the pleasure which they themselves feel it to yield. If, then, these feelings manifest themselves at all, the contention is a valid one, viz., that they may be developed by training, and our methods of prompting to action should provide for their exercise; nay, further, should be arranged so as designedly to develop them.

Some dangers indicated—also a remedy.

With large classes of scholars almost equal in attainment, and with skilled teachers who know exactly what is required in the way of intellectual result, there is danger lest the entire class should every hour of every day be kept at exactly the same work under the immediate direction of the teacher, so that the opportunity for independent effort on the part of the scholar scarcely ever arises. Home lessons—where some amount of independent effort must be exercised—are not required, for the lines of work are so skilfully laid for obtaining the maximum effect at the end of the year that this small amount of independent effort is easily dispensed with. On the other hand, where the upper classes are small and the teacher's attention is divided and weakened by being spread over a number of separate groups, recourse must be had to the lower stimulus to exercise. These are necessarily therefore continued into a time when other and higher motives should prevail. The educational and only sound position appears to be this:—An effective staff, trained to recognise the changing conditions of mental training which pupils at various ages manifest, and not unduly biassed in favour of obtaining a high intellectual result to the comparative neglect of those moral forces by which these results are obtained.

Self-Control.

It is generally acknowledged that the results of school teaching are of greatest worth when with the acquisition of knowledge there is the development of intellectual power and the strengthening and growth of the higher motives (moral power) to action. At first the child is controlled by its teacher; it is almost entirely dependent upon the stimulus of the teacher's presence and active co-operation. In a less degree it acts from imitation of, and in sympathy with, its fellows. This sympathy of numbers, as it has been termed, is a recognised stimulus to activity, and is

especially powerful whilst the mere imitative impulse is strong, *i.e.*, in early years. In later school days this power continues to act, but with gradually weakened force, until in adult life action is considered weak which has no other reason than that others have acted and still continue to act in a certain direction.

Whilst the direct and personal influence of the teacher over his pupils can never be too strong; at the same time, a teacher whose power over his scholars is great, can best afford to cultivate a spirit of self-reliance in his pupils. His scholars need to practise this form of control if it is to be developed, and opportunities should be given for its exercise. At first such exercises should be short, so as not to risk an exposure of the pupil to failure; gradually, however, they may be increased in number, and each may be lengthened in time, until the power of self-directed effort becomes strong and habitual.

ATTENTION.

Introductory.—This is an essential condition of all successful mental effort. At every stage throughout the entire range of intellectual operations this attitude of mind is absolutely necessary. Sounds may proceed to our ears, and sights meet our eyes, but neither sounds nor sights make any impressions unless there is a mind more or less free to receive them. When we leave the region of sensation and perception, and examine the conditions of memory, it is found that with the greater concentration of the attention fewer repetitions are needed to make impressions lasting; the associations also made when the attention is riveted upon the effort are most likely to recur together. Leaving the simpler and earlier forms of intellectual effort and proceeding to conception, judgment, and reasoning, attention is seen to be more than ever necessary. Seeing then that attention is so important a factor in school work, the mode in which it manifests itself, and the conditions under which it may be developed, form most important enquiries for the teacher.

Two Contrasted Examples.—*Involuntary and voluntary attention.*

If we watch a very young child it appears to have but little control over its power of attention. Introduce a new toy, make a strange noise, bring its hand into contact with a fresh surface, any or all of these are sufficient to command its attention for the time. It may appear to be almost inconsolable on account of some trifling loss; change, however, its surround-

ings, and at once, and with the greatest apparent ease, it is comforted, and changes its tone accordingly. By way of contrast take the youth who with concentrated effort is set upon the solution of a difficult problem in arithmetic ; he seeks a place of quiet, and all thought not helpful to the effort in hand is immediately banished. He now resents any interruption, though at other times the suggested change would be gladly accepted ; and thus with steady application along the stages of his work, and with stern refusal of all diversion, he continues with fastened attention until the required work is done. In both these cases there is attention, but of a very different kind ; that of the child is uncontrolled, so far as the subject of it is concerned. The exercise of attention is in the case of the infant *involuntary*. In the example of the youth, however, there is designed effort for the accomplishment of a definite result. This form of attention is termed *voluntary*.

The latter form of attention is that which our school training should seek to form. The voluntary rises out of the first or involuntary form, and is a development of it. It may prove useful to indicate a few of the conditions by which the attention is exercised, and how progress from the early (*involuntary*) form of attention to the later (*voluntary*) may be aided.

i. *Bodily condition.*—The body must be in a healthy state, so that no centre of disorder is intruding itself upon the child's consciousness, and thus absorbing a certain amount of attention. The exercise must not be prolonged until fatigue is induced. The time-table regulates the length of the lesson, and to this end should take into account two things, (*a*) the age of the pupil—with older children the attention may be maintained much longer than with the very young, (*b*) the nature of the lesson—mental arithmetic, for instance, requires much closer effort than either drawing or a lesson in geography. The first of these lessons should therefore be short.

ii. *The nature and stage of the subject.*—The first lesson in a new subject (if too many difficulties are not introduced at once), and a fresh stage in a subject in which some progress has already been made, are lessons which readily secure the attention of the class. Contrast with these lessons, those of mere revision, especially when towards the close of the year frequent review of the same matter is enforced almost to weariness. In these lessons of review the teacher secures the necessary amount of attention by the extra stimulus to effort which he is able to bring to bear upon the pupil.

iii. *The removal of all distracting influences.*—All know how difficult it is to keep the thought of the class when something else is bidding for their attention—all work is stopped whilst the gas is being lit ; a mouse playing across the floor in front of the class is destructive of all attention to lessons. The work of two adjacent classes may be mutually destructive ; a class engaged in a parsing lesson will do very little whilst another group, in full view are working at a series of experiments in elementary science ; a noisy lesson may prevent a neighbouring teacher being continuously heard, and the class, failing to follow, soon becomes inattentive.

The organisation of the classes must provide for the reduction to a minimum of all distraction, otherwise the growth of attention will be seriously hindered.

iv. *Interest in the work to be done.*—Interest has so close a connection with attention that the terms are sometimes interchanged. When interest is aroused attention is secured. Some lessons never fail to awaken interest, amongst these are the object lesson and lessons in elementary science, especially where experiments are performed and objects are shown. Other lessons less attractive in themselves become interesting by the mode in which the teacher presents his new material. Some schools manifest an interest in the grammar lesson, and excel in this subject; others have a marked preference for, and a corresponding excellence in, geography. In each case the method of teaching will invariably explain the fact. Wherever knowledge is full, and the teacher's power of arrangement and illustration is developed, the mode of presentation is attractive, the interest is aroused and the attention is maintained.

v. *The work must be suited to the pupil's capacity.*—Infant attention is best aroused by a plentiful occupation with things. The training to see and touch and hear, and thus to gain a reliable stock of perceived knowledge, is peculiarly the best exercise for the infant intelligence. Up to the ages of nine and ten memory is very active and the child's attention is best occupied in arranging and associating the mental images which perception and imagination present. Words and language, with spelling, are attended to and retained up to this age with remarkable ease. Afterwards the pupil arranges his stores of knowledge, and his attention is concentrated upon the processes of comparison necessary for the formation of general notions and of judgments, and for operations in reasoning. If, then, we would secure the attention of those whom we teach throughout the entire school course, it will be necessary for us to adapt our course of instruction to the known capacities of the pupil at different stages of its school life.

The habit of attention.—The full value of our training of the attention is felt when the habit of attention has been formed. It is remarkable what continued and oft repeated exercise will effect in any direction or phase of mind culture. In no form of mental effort is the influence of continued application and patient endeavour more apparent than in this of attention.

MENTAL DEVELOPMENT.

The various forms of mental activity have been grouped under the headings of *Intellect*, *Feeling*, and *Will*. The development of intellect concerns the teacher most, and is therefore selected for the purpose of making clear to the young teacher what is commonly understood by the term 'mental development.'*

* The development of feeling and will has been briefly noticed under each of these headings.

Development may be viewed in two aspects. There is (1) the growth or development of any particular power or faculty—perception, for instance; and there is (2) the gradual advance of intellect from its early manifestations in sense impression, through those of perception, memory, and imagination, to the higher intellectual operations of conception, judgment, and reasoning.*

In the first of these aspects it has already been shown that development in sense perception is marked by an advance from the ability to distinguish single and very pronounced differences of impression to ability to recognise the slightest change, and also to associate a complex group of impressions with the object yielding them, as in the perception of an apple; in memory, development is manifest in the substitution of efforts to establish associations of similarity for those of interest aroused merely by some attraction in the external object; in conception, ability to form the general notion of wide groups of objects in which the resembling features are few, is a late and difficult effort.

In the second aspect development may be indicated by a brief review of the order in which the intellectual faculties are unfolded, *e.g.*—

1. *Sensation*, which furnishes the sense elements or impressions out of which the mind fashions its knowledge of external objects.
2. *Perception*, or the association of a group of sense impressions with an external object present to one or more of the sense organs, and *Observation*, which is perception designed and directed for the purpose of gaining further knowledge.
3. *Memory*, the storing up of the mental images which perception yields, and *Imagination*, the transforming of these images into mental representations of knowledge beyond the region of experience.
4. *Conception*, the advance to general and abstract knowledge—purely mental products, fashioned, it is true, out of the particular knowledge which has been originally obtained by perception and retained by memory, but quite distinct from either.
5. *Judgment*, or the establishment of the true relations either between different concepts, or between individual and general notions. And lastly,
6. *Reasoning*, which either uses facts or judgments already established to form more general truths as in inductive reasoning, or which applies the general principles already formulated in explanation of particular truths, as in deductive reasoning.

In its fullest meaning 'development' is the exercise of a power or faculty of the mind in such a way that its efficiency as a means of acquiring knowledge becomes increased; at the same time, it is exercise which gradually secures advancement from a simple form of intellectual or other mental effort to one more complex.

* It has been suggested that the term '*growth*' should be used for the progress of ability in any particular faculty, whilst '*development*' should include not only growth in any particular faculty, but also the general advance of ability as manifested in the succession of operations from perception to reasoning.

N.B.—The intellectual powers are closely connected.

It is not necessary to do more here than simply to remind the young teacher that judgment and memory can be traced (in crude form it may be) in both sensation and perception. In the same way, the exercise of memory and imagination are continued throughout the forms of intellectual effort termed thinking, viz., those of conception, judgment, and reasoning. Similarly it may be shown that the remaining intellectual powers are connected with each other.

Educational maxims, phrases, and terms.—There are maxims and terms in daily use which embody sound educational principles. It is proposed to enumerate the more important of these, and as far as necessary to show the relation of each to the principles of mental training and development.

1. **From concrete to abstract.**—This truth is perhaps best exemplified in the method we adopt in teaching an infant its first notions of number. It should, however, be equally clear that the same doctrine holds in all departments of knowledge :—the concept which is abstract is based upon the particular and concrete knowledge presented by memory and observation ; in grammar we proceed from examples to rules ; in science, from facts to principles. All inductive teaching is also in complete accord with this maxim.
2. **From the known to the unknown.**—The essential feature of all teaching by illustration is embodied in this truth. All successful efforts of imagination require an accumulation of mental images forming the *known:* from these by a process of transformation the intellect proceeds to fashion the hitherto *unknown*. The abstract knowledge referred to above is obtained from reflection upon the concrete, which must be first *known*.
3. **From indistinct to clear : from indefinite to definite.**—These phrases have been already referred to in the process of forming the concept or general notion. The resembling qualities which together form the type image of a complete group or class of objects are not at first distinguished. They are present, it is true, in every individual constituting the group, but not until the operations of abstraction and generalisation have been successfully performed do these resembling qualities stand out clearly and distinctly from the qualities which are not common to the group and which do not therefore enter into the concept or general notion. In the same way a definition, a rule, a truth, when first announced may be vague and indistinct; all these, however, gradually become clear and definite by the supply and examination of examples. The deductive method of teaching is concisely described by each of the above phrases.
4. **Things before words ; ideas before language ; supply a term when it is needed.**—'When the want of a word has preceded the possession of it the child can apply it naturally and justly.' 'If children be obliged to pass over words without comprehending them in books, they will probably do the same in conversation, and the difficulty of teaching such pupils and of understanding what they say will be equally increased. If their language be confused

so will be their thoughts, and they will not be able to reason, or to write with more precision and accuracy than they speak. When we speak of sensible, visible and tangible objects we can easily detect and remedy a child's ignorance; we can also make children understand the meaning of those words which are the names of simple feelings, such as surprise, joy, and pity, but how explain words like virtue and justice? All that a prudent person will attempt is to give instances of different virtues. General and abstract terms are, as it were, but the endorsements upon the bundles of our ideas; they are useful to those who have collected a number of ideas, but utterly useless to those who have no collections ready for classification.' *

5. **Information, Instruction, Education (Training).**—The first of these terms presents but little difficulty; whenever we announce a fact, or state a truth, or communicate an item of news, we supply information. The sound of a word in reading, the shape of a letter in writing, a table in arithmetic—these may all be told and be mere matters of information. The enumeration of the capes and bays round the English coast, the dates of the accession of the kings and queens of England, and the definition in grammar, may be repeated until they are remembered. These are received by the pupil by way of information.

Education and Training seek either to supply information, or to lead the learner to acquire it in such a way that, not only is the information acquired, but the pupil is guided to the acquisition of knowledge by the exercise of his own power. Information thus gained is of double service; it enters into our store of knowledge, and in doing so develops the power which it exercises. Education, says the founder of the *Training System*, consists not in the mere amount of knowledge communicated, but in the due exercise of all the faculties whereby the pupil acquires the power of educating himself. The simultaneous cultivation or exercise of all the powers of our compound nature alone '*trains*' the child and secures the highest attainment of each faculty. The sympathy of our nature is such that the non-exercise or over-stretching of one power or faculty to a certain extent weakens the others—bodily health and vigour having an influence on the intellectual powers, and *vice versâ*, whilst the exercise of the moral faculties and feelings gives a healthy and energetic tone to all.

The term *instruction* is by some used as synonymous with the act of imparting information, and by others (Stow, for example) it is applied to intellectual exercise apart from the exercise of the moral and physical nature. When information is arranged so as to become associated with other knowledge, and of service in further acquisition, as, *e.g.*, in reading, when the sound of gh in the words cou*gh* and lau*gh* is shown, or in writing when the shape of the letter y is taught in connection with the letter j, and in arithmetic when the table is used in solving sums in multiplication and division; in each of these cases something more than information is imparted. The mind is being furnished with information;

* Practical Education, Edgeworth.

at the same time, power is developed by which further knowledge may be acquired. It is evident that as soon as the teacher arranges and classifies the information he imparts so that the associations become helpful to the memory, and at the same time furnish material for the higher operations of conception, judgment, and reasoning, that then the instruction becomes in a more or less marked degree educational.

6. **'One thing well.'**—'In the situation of the beginner in any branch of knowledge,' says Dr. Bain, 'it is expedient to abide by one course, one scheme, one book, although not absolutely perfect. When the very ground-work has to be laid distracting views are to be avoided, but when once thoroughly known, defects may be pointed out and alternative lines indicated.' Locke says, 'but in this, as in all other parts of instruction, great care must be taken with children, to begin with that which is plain and simple, and to teach them as little as can be at once, and settle that well in their heads before you proceed to the next or anything new.' These injunctions should not debar the teacher, however, from presenting two related topics at the same time, especially if by contrast or comparison both facts are made to stand out more clearly by the connection. In teaching the nature of a noun, for instance, it may very wisely be contrasted with that of the verb; the infinitive mood with the indicative and the imperative; the notion of a fraction with that of a fragment; and the compound with the complex sentence.

   In teaching Arithmetic the effect of attempting two methods at the time of learning a new rule is most serious; confusion is almost certain to follow.

7. **'Sympathy of numbers.'**—This feature of school life and work takes different aspects at different periods. 'In the infant school,' says Madame Necker, 'children seldom take as models those who differ from them much, either in age or situation . . . . Order, obedience, civility, truth are communicated to one another by the force of example, and from the external imitation of these qualities a real feeling of them is produced. And, as regards their lessons, it is often possible to fix the attention of a number of children upon objects in which it would have been very difficult to interest a single child.'* In junior schools the effect of numbers is to awaken emulation and thus to sharpen effort. In senior classes independent effort should be encouraged.

8. **'The Law of Habit.'**—A habit is a power and a tendency to act in a given direction, together with a facility in such action gained by frequently repeating the effort. The force of habit is manifest in every feature of school work and control. The various intellectual operations tend to become habitual, *e.g.*, a child trained to close observation in school will make a careful and habitual observer in after life. The discipline of the school should aim at the development of the habits of attention (see p. 77), of self-control (p. 75), of diligence, of obedience, &c. Hence the study of the law of habit is a matter of the most practical importance to all teachers.†

* Quoted from Currie's Infant School Education.

† For full discussion of 'the law of habit,' see the author's '*School Organization, Discipline and Hygiene*.'

ORAL LESSONS:

HOW TO PREPARE, GIVE, AND CRITICISE THEM—WITH SPECIMEN NOTES OF LESSONS.

Introduction.—In the following pages it is proposed to furnish help to young teachers in the preparation of lessons in all the common subjects of school instruction accompanied by typical 'Notes of Lessons' in each branch of school study.

Oral Teaching—a form of Conversation.—We acquire readily and retain permanently that about which we converse. Our knowledge of a given subject may be limited, but by speaking to others who have fuller knowledge our area of information becomes widened, errors are corrected, that which we already know is confirmed, and the whole subject becomes permanently fixed in the mind.

> In giving an oral lesson to a class of children the teacher converses, in turn, with each of his pupils, and if he has the full attention of his class the conversation throughout the lesson is shared by all its members.
>
> When all the scholars in a class thus share in its work we have that condition of oral teaching which is most effective in brightening the entire school life and work.
>
> A few lessons of a conversational kind taken with the sole object of arousing the united thought and combined effort of a whole class will be found of high educational value, even though the information imparted cannot be utilised on the day of examination.

Children should be encouraged to speak.—Dr. Fitch in his 'Lectures on Teaching' says: 'If the teacher does all the talking and the pupil only responds with single words the questioning is bad. The great object should be with the minimum of your own words to draw out the maximum of words and of thought from him.' This is eminently practical advice; it has been repeated in text-books of school method; it is impressed upon the student teacher and pupil teacher in lectures and by

personal advice; the fault, however, of the teacher speaking far too much and the pupil far too little still manifests itself in almost every lesson. In the advice which these pages are intended to offer to young teachers on the preparation and the giving of their lessons, the importance of first arousing the thought and afterwards of exercising the speech of their pupils will be constantly kept in view. The following are examples of teaching in which children are encouraged to speak:

1. If **an object or a picture** be brought before the class it is not sufficient for the teacher to exhibit it and to talk about it. The children must be allowed to examine it for themselves; if the object or picture cannot be submitted to all for personal inspection, allow one or more to take it in hand, and encourage these to state, what they see, to the entire class.

   Next to speaking himself it is important that the scholar should listen to the speech of a fellow scholar. Children appear to learn to speak more quickly and easily, if not more correctly, from mixing with and talking to other children than from hearing the speech of adults.

2. **A grammar lesson** provides abundant opportunity for the exercise of speech on the part of the scholar. After a few typical examples have been supplied by the teacher and the point or principle in grammar which they illustrate has been seized by the class, then the teacher should call upon his scholars to make other examples which similarly illustrate the principle or rule under discussion. When apt examples can thus be formed by the class they afford reliable evidence that the rule is known. The next and higher effort will be to allow the pupils to state the truth which their examples illustrate. In this way the grammar lesson may be made an excellent means of exercising the powers of speech which the children possess.

Correct Speech: its value and how to encourage it.—Correct speech is closely connected with sound thought, so connected in fact that they act and react upon one another, for whilst it is true that no one can speak correctly who does not think clearly, it is equally true that no one can indulge in loose and incorrect speech without weakening his power of clear thought. The young teacher is therefore strongly advised to form early in life the habit of speaking well himself, and then of requiring correct speech on the part of his class. It is surprising how soon the speech of a group of children working together can be improved. If a teacher who has not practised his class in speaking in complete sentences will test his scholars the next time he takes them for an oral lesson, he will find that not more than one child out of ten, in giving an answer, will attempt a complete reply.

If, for example, a process in Arithmetic is being explained and a boy is asked how to find the total cost of twenty sheep at the rate of two pounds each, the reply will be 'Multiply.' The answer is no doubt correct, in so far as the boy's words exhibit to us the process he would employ; he should, however, be encouraged to say, 'Multiply the two pounds by twenty,' or still better, 'Multiply the cost of one by the number of sheep bought.' The form of answering which children should be encouraged to adopt will be more fully explained in future pages. It will be sufficient here to warn the young teacher against the most common forms of reply which encourage faulty and incomplete speech.

Single word answers on the part of scholars as a rule should be discouraged. Children should be led to amplify them into complete sentences, and very rarely indeed should a question be so formed as to require single words for answer.

Avoid the **elliptical** form of answer. These answers are very readily supplied, and the teacher is apt to be misled by his apparent success. A habit of using the elliptical form is easily contracted, and is very difficult to correct, and when extensively indulged is very weakening in its effects on both the thought and the speech of the class.

Summary of truths established.

1. That oral teaching should as far as possible be conversational—that anything in the nature of a lecture should be avoided.
2. That as expression by speech serves to fix and give directness to our thought, the teacher should use language carefully himself and require accurate and complete statements from his scholars.
3. That children should in every way be encouraged to exercise their powers of speech during the progress of a lesson, and that all forms of questioning which foster incomplete statements on the part of the scholar should be avoided.

THE PREPARATION OF A LESSON.

There are very few lessons given by the pupil or student teacher which are not vastly improved by thorough preparation. Even the commonest subjects of school instruction admit of it. One of the secrets of Dr. Arnold's success as a teacher is found in the fact that although a complete master of the subjects he taught, he rarely, if ever, faced his class without preparing the

lessons for the day. The following among other reasons account for the need of preparation :—

1. **Oral Instruction is a complex effort.**—The teacher must communicate his facts and perform his experiments, he must regulate the observation of his pupils and guide their attempts at reasoning, he must estimate the effect of his teaching by the accuracy or otherwise of the answers given, he must be ready to supplement where he finds their knowledge is incomplete, correct where it is faulty, and throughout the whole he must maintain the logical sequence and continuity of his own thoughts whilst he stimulates into activity the interest and thought of his class.

   Now, whilst no amount of preparation will enable the novice in the art of teaching to do all this with success, it is equally true that the skilled teacher is greatly aided in teaching the most familiar subjects by a careful and immediate preparation.

2. **We take most interest in that which we have recently acquired.** It is moreover reproduced by us with an added life which the recital of what remains of an old lesson never possesses. Thus the revision of an old lesson accompanied by new facts and modern and more apt illustrations imparts a freshness to the lesson as helpful to the teacher as it is stimulating to his class.

3. **The Preparation of Apparatus** of some kind is needed in almost every lesson. When these are properly used they have a powerful effect in sustaining the attention of the class. Scarcely a reading lesson is given but would be improved by the introduction of an object or a picture : the writing lesson should appeal to the eye as much as a drawing exercise ; first notions of number are based upon the concrete, and rules of arithmetic are often best explained by the aid of diagrammatic illustrations ; no geography lesson is complete without an array of models, maps, pictures, and specimens. It is thus evident that in nearly all the ordinary subjects of school instruction (grammar is excepted) the preparation of apparatus and materials is necessary.

The matter of the Lesson must be prepared :—

(*a*) *As to suitability* :—This will be determined largely by the knowledge already possessed by the class. If the lesson be one of a series and given by the regular teacher of the class, the new information will be readily connected with that supplied in previous lesson, and thus be suited to the requirements of the pupils. Should, however, the teacher be new to his class, as is the case with students in practising schools, the teacher's first duty is to make himself thoroughly acquainted with the knowledge his pupils possess of the subject he has to teach.

The amount of knowledge a teacher is able to display is of little avail if the minds of the children are unable to accept it; on the other hand the repetition of old matter will be certain to fall on unwilling ears, and fail entirely to arouse either the interest or the thought of the class.

(*b*) *As to arrangement*:—When by careful study the teacher has thoroughly mastered the subject-matter of his lesson so as to be able to state clearly the information he wishes to communicate, and to meet any enquiries his class may start during the progress of the lesson, and when he has enquired into the condition of his class, it is then his duty to arrange his matter in the order best suited for its acquisition. His object in this must be threefold, viz.:—

(i.) to make acquisition on the part of his pupils easy and natural,

(ii.) to aid and exercise the work of reproduction, and

(iii.) to exercise and develop the intellectual powers of his class by means of the efforts of acquisition and reproduction which his lesson stimulates and guides.

In order to secure this threefold object the teacher must arrange his matter in logical order. There is no part of the preparation exercise which will demand higher effort than this. The lesson should be one of a series, so arranged that each lesson, whilst it provides what is new, is related to that which has gone before, and is a preparation for another lesson to follow. The several parts also of each lesson should follow a natural and logical sequence. In a lesson in grammar, for instance, examples precede rules and definitions; in science, experiments prepare for the establishment of laws; in arithmetic, mental exercises, dealing with concrete cases, lead to the statement of rules; in geography there is the association of related facts, *e.g.*, a mountain range with its termination in a promontory on the coast; a river with the valley it has formed; the productions of a district with the industries of the people and the situation of the towns.

When the teacher is able to secure the co-operation of his pupils in the collection and classification of his facts and examples, and especially when he is able by this effort to lead them to the establishment of general truths and their embodiment in rules and laws, then he places his class in the best possible condition for satisfying the threefold object he has in view.

Black Board Sketch.—The preparation of an oral lesson should not be considered complete if it does not provide a carefully planned abstract by which the teacher registers on the board the results of his teaching. He cannot make this

satisfactorily as the lesson proceeds. If he attempt it he will probably put down far too much and arrange it so that it becomes more confusing than helpful to his class. He should know exactly what his board sketch is to contain, and how it is to be arranged. The black board sketch secures the following amongst other advantages:—

1. The clear outline of the lesson in the mind of the teacher.
2. A complete view, at a glance, of the essential features of the lesson for the class.
3. The frame-work upon which the class may develop a full and connected reproduction of the lesson in the form of a composition exercise.

ILLUSTRATIONS: WHAT THEY ARE, AND HOW TO USE THEM.

Oral teaching possesses the great advantage over self-instruction by reading and by task work, that at every point of the lesson where difficulty presents itself the teacher is present to place the matter in a new light or to supply additional material; in fact, it is the skill the teacher manifests in recognising and in clearing up these difficulties that constitutes the chief value of oral teaching. In his effort to assist the scholar to acquire new knowledge the teacher resorts very largely to illustrations. These may be:—

1. **Verbal**, in which the teacher refers to something which is already in the minds of the children, and which is readily recalled in response to his statements.
2. **Pictorial**, by which either a complete representation of the object under discussion is exhibited, or a diagram is drawn showing distinctly the portions of the figure in which most difficulty presents itself.
3. **Objects, Models, Apparatus,** which are capable of being brought under the immediate observation of the class.

Before taking the three forms of illustration named above in detail, it may be well to note, that whatever may be the form of illustration adopted by the teacher, it should be familiar to the class; that an illustration which itself requires explanation is faulty.

A young teacher, recently taking a first lesson to Standard III. on the County of Middlesex, began by referring to the size of London. He sought to impress this by a description of the small country town whence he had recently come, and by contrasting it with the size of London. Now whilst this was an illustration admirably suited to the thought of the teacher and most helpful to him in his efforts to realise the immense size of London, it did nothing to assist the London boy. The teacher was advised to take some area well known to all the scholars in the class ; to show this area on a sketch map and make a comparison between it and the wider area covered by London ; and thus to encourage the children to estimate by careful comparison the size of London, and the time required to walk across or travel round it. In this way the children, instead of starting with an illustration which is unfamiliar and which leaves them in a hazy and doubtful condition of knowledge, begin with what is known, and by a process of comparison and contrast arrive at some sound and serviceable knowledge of the size of the town in which they happen to live.

Verbal Illustrations.—What we understand by the term verbal illustration may be best explained by the following contrasts between the methods of **telling** and of **training**, respectively.

Example 1. Suppose the word 'carnivorous' occurs in a reading lesson : I may explain it by simply stating to the class that 'all animals which prey upon other animals are termed carnivorous,' or more briefly still that the word means 'flesh-eating.' This is the *telling* method. I may, however, begin by illustrating the use of the term—contrasting the food of the horse with that of the lion, that of the tiger with that of the cow, and that of the wolf with that of the rabbit ; then I may lead the children to group the animals named into two classes, viz., those which eat flesh and those which do not ; and afterwards apply the term 'carnivorous' to the group containing the flesh-eating animals. and finally ask the class to define the term. This latter is the *training* method.

Example 2. In a **Grammar Lesson** I may tell the class that 'a pronoun is a word used instead of a noun, to prevent the too frequent recurrence of the noun in discourse.' I may, however, lead the children to the same truth by the following process :—

(a) **Examples supplied by the Teacher :**

1. John wrote beautifully and John gained a prize.
2. Jane ran to school, but Jane was late.
3. The bee flies from flower to flower and the bee gathers honey.

(b) **Corrections made by the Class :**

1. John wrote beautifully and **he** gained a prize.
2. Jane ran to school, but **she** was late.
3. The bee flies from flower to flower and **it** gathers honey.

(c) **Children to make similar examples to Group (a) and correct them as in Group (b).**

(d) **Collect the results of the teaching above:**

1. That there is an awkward repetition of the noun in the first group of sentences.
(*Children led by teacher to state this.*)

2. That this is avoided in the second group by using another word in place of the second noun.
(*By children and teacher.*)

3. The word used in place of the noun is called a pronoun.
(*Told by the teacher.*)

4. Definition of pronoun. (*Told by the children.*)

Example 3. In a **History Lesson** I may wish to teach that 'William the Conqueror was a powerful monarch.' The simple statement will convey a vague notion of the truth, and this may or may not remain—a mere skeleton of knowledge—in the child's mind. If, however, I relate the story of Senlac, the power and bravery of William as a soldier become evident; his development of the feudal system illustrates his power of statesmanship; his treatment of his brother Odo and his son Robert is evidence of the strength of his will. Thus, by a careful examination of three striking features of William's reign, the children may be led to a much more complete and full notion of the term 'powerful' as applied to William the Conqueror.

In each of the above cases the *telling* method proceeds by the short way of definition and direct statement, whilst the *training* method in each case is based upon a collection of examples used as verbal illustrations. Children are required to take the examples and illustrations supplied, and by way of comparison and contrast to discover truth for themselves, and through the effort to get that training in processes of thought, which in after life will be vastly more valuable than whole stores of fragmentary facts and statements.

Pictorial Illustrations—Pictures and Diagrams.

A good supply of pictures is valuable not only for the brightness they impart to the schoolroom, and the interest they awaken in the minds of the children, but also because they form the quickest mode of conveying correct and reliable information about distant objects and places. The pictorial illustrations which are most effective for the purposes of oral teaching are not those which usually decorate our school walls. Maps, illustrations of various forms of natural history, scenes from nature, historical events, mechanical powers, industries, trades, &c.—these have their place, and often yield valuable information when other means of teaching are not available, as, for instance, during periods of relaxation from school lessons. The pictorial

illustrations, however, most effective for teaching purposes are those which the teacher draws during the progress of his lesson. These sketches are valuable for the following among other reasons:—

1. The object can be drawn to any scale.
2. Any portion of the drawing of special interest and importance can be still further enlarged, and thus more clearly impressed, *e.g.*, the structure of the eye or of the foot of an animal, a selected district in geography, an operation in science.
3. Unimportant details may be omitted, and thus the attention of the scholars concentrated upon the most essential features.
4. The drawing may be developed as the lesson proceeds.
5. By means of coloured chalks, confusion between different portions of the drawing may be avoided.
6. Thorough preparation on the part of the teacher is ensured.
7. When copied by the class it forms a concise record available for entry in their note books, and at the same time is a training for children to embody their notions in graphic form.

Should the teacher find it necessary to prepare completed sketches before beginning his lesson it is best to cover the portion of the drawing not required during the early stages of the lesson with paper held by drawing pins, and uncover each portion of his drawing as it is required. Children are close investigators of pictures, and when an entire drawing is shown at first, the teacher finds for a time the attention of his class difficult to direct; and the gradual unfolding of his drawing has the further advantage of maintaining the spirit of expectancy in his class throughout the lesson.

Object Illustrations.—Objects, Models, Home-made Appliances, &c.:—

It has already been stated that all or some of the above forms of illustration may be brought with the greatest advantage into almost every lesson. With their introduction an awakened interest is at once manifest throughout the entire class. Unusual efforts are put forth by even its dullest members to see and handle the new object. When the class is questioned at intervals upon what is remembered it will be found that whilst very much that was verbally communicated is forgotten, the information gained by a personal inspection of objects remains, and is the first to be reproduced. Over and beyond the help to acquisition and retention which a display of objects and models affords, there are distinct educational advantages which no other form of teaching secures so fully and readily. There is, for example, the close and well-directed observation, by which first-hand knowledge, both full and accurate, is obtained; the classification of the facts observed

is conducted under the most favourable conditions, for whilst the effort is easy the results are sound and lasting; the inspection of the gradual production of the finished article through a series of manufacturing stages, and the observation of the sequence of effects obtained during the progressive stages of an experiment, these form an admirable preparation for the study of the more subtle and complex operations in nature and in science; and throughout the entire exercise there is induced a concentrated state of mind, which through repeated effort tends to become habitual, and this, when formed, will be of immense service in other branches of school study, and in every effort of life.

Objects should be collected as far as possible through the scholars and their friends. *Local industries* and the natural products of the surrounding district should be very fully represented. All these should be labelled and arranged in a school cabinet. Any object mentioned in the text of the *reading books*, not already in the cabinet, should as far as possible be obtained and be ready for exhibition when the lesson in which it is mentioned is taken. The natural products of the area selected for the *geography* lessons of the year form other objects of great service, and to these may be added the manufactures of the district, showing as far as possible the stages of the industry, from the raw material to the finished article. The *specific subjects*, especially if a science be taken, will demand the collection of material and the making of apparatus.

Models, Home-made Appliances, &c.—These are often found to be far more effective teaching material than the more elaborate and highly finished article which may be purchased. As a sample of many which have been made and found successful, the following may be mentioned :—

1. Models of countries, counties, river basins, &c., in sand and in plaster.
2. The phases of the moon, illustrated by eight painted balls, each mounted on the straightened wire of a bill file.
3. The eclipses of both sun and moon, illustrated by taking a piece of stiff cardboard to represent the plane of the ecliptic, with four discs of cardboard to represent the moon's orbit, and intersecting the first plane at an angle of 5°, and with the line of intersection (line of nodes) constant in direction.
4. A collar box with a circular disc poised on a peg and carrying beneath it a magnetised bar of steel. This will illustrate the construction and action of a mariner's compass.
5. A bar of soap is readily carved into the model of a bone, and, with the addition of powder obtained from coloured chalks, the structure of a section of bone is easily and almost perfectly imitated.
6. The action of water in springs map be illustrated by taking a small box having a glass side, and by arranging clay and gravel in alternate and inclined layers. The water when poured on the top of the layers will run along the gravel bed between the layers of clay, and may be collected as at a spring, if holes be made at the end of the box into the gravel.
7. Boys have made for themselves kaleidoscopes, cameras, magic lanterns, the puzzle of looking through a brick, &c., thus applying the most important laws of reflection and refraction of light in the most instructive manner.

The above are examples of very many appliances which teachers and scholars may devise for the interesting and intelligent teaching of the *class* and *specific* subjects. Children are especially delighted when an object, which they themselves have constructed, is counted worthy of a place in the school museum.

HOW TO GIVE A LESSON.

The Introduction.—If the lesson be one of a well-arranged series, as we strongly advise it should be, it will suffice to revise briefly the chief points taught in the previous lesson, for in this way a connection is easily and naturally established between the matter already acquired and that to be taught. A few questions will be sufficient to recall the most important facts and truths of the past lesson, and at the same time serve to arouse the mental activity of the class, awaken their sympathy and enlist their co-operation. If no previous teaching is available upon which to base an introduction, announce the subject of the lesson, and at once begin to teach it.

The young teacher is strongly cautioned against attempting to lead the children to the subject of his lesson by a process of training. Such introductions are often attempted, and are very rarely successful. A teacher recently gave a lesson on 'Chalk.' As the children were in a London school he thought they might know Brighton. By questioning them, he found that many of his scholars had been there. 'Well, what did you notice?' said the teacher. 'Boats, the steamer, the pier.' These and other objects of interest were given in answer by different children; some boys were anxious to cause a diversion by suggesting donkeys, niggers, &c., but one boy fortunately thought of the '*cliff*.' 'Yes,' said the teacher, delighted to be getting near, as he thought, to the subject of his lesson. 'What was the cliff composed of?' 'Stone,' 'concrete,' 'cement,' said the children in succession. 'No, I don't want those,' said the teacher, almost in despair. 'What are the cliffs composed of when you get away from the town?' After wasting five minutes' time, and still worse, after diverting the thought of the class from the subject to a host of particulars of no value for the purposes of his lesson, he proceeded to examine specimens of chalk with which he had provided himself. This was where he should have begun his lesson, but having taken the children in thought to Brighton, it was with difficulty that he brought them back to observe the specimens of chalk he held before them.

As soon as possible, therefore, pass over a carefully thought-out introduction, and proceed to make the class understand that you have something new to impart. Children soon weary

of revising past work; the introduction should quickly place the scholars in the attitude of those who are anxious to learn, and the best way to ensure this is to show them that the teacher is prepared with a lesson he is able to teach. The following methods are suggested as simple forms of introducing some of the common topics of school instruction:—

A **grammar** lesson is easily introduced by placing sentences on the board for inspection by the class; an **object** lesson by the exhibition of an object, or a picture, or by the performance of an experiment; the **geography** lesson by showing a model of the district selected for teaching; a **reading** lesson by a very brief account of the subject of the lesson, of its author, or of the conditions surrounding the events of which the lesson is an account; a **writing** lesson by the exhibition of a few very common faults in the writing of the class, followed by a specimen of excellent writing on the black-board in the teacher's best style; and the **arithmetic** lesson is best prefaced by a few simple examples, to be worked by the class mentally, and embodying as far as possible the rule to be taught or applied.

The Lesson proper and how its Matter may be communicated.—Every lesson should aim at carrying further the knowledge already in the possession of the class, and whilst the children may be led to secure some of the new knowledge for themselves there will necessarily be other matter which must be communicated by the teacher. He must, however, be always on his guard against continuously talking to his class for more than a few seconds at a time. There is danger, unless this caution be observed, that too much matter may be supplied for complete reception by the class. When this fault occurs, it soon becomes evident in the indifference which the children begin to manifest; the method of teaching must be immediately changed; the children must be encouraged to take a more active part in the lesson; questions must be asked upon what has been told, and attempts made by the children to connect what has been taught with anything they previously knew. In this way the teacher will be able to impart new matter suited to the capacity of the children; he will secure the advantages of a thorough review of what has been already learned without the irksomeness of a formal revision; erroneous notions will be discovered as soon as formed and before they have become established, and through all the lesson the teacher will carry with him that thought and effort on the part of his scholars which no amount of lecturing alone is able either to arouse or to maintain.

(a) Matter taught by a judicious admixture of Statement, Illustration, and Questioning.—Much of what is called 'tact' in teaching is the power a teacher manifests during the development of his lesson to determine which mode he shall adopt in communicating his information. It is obvious that when an object or an experiment is under observation there is very much that the children themselves should state, and the more they can be encouraged to tell, the better; at the same time there are less obvious qualities in an object, and there are subtle processes in an experiment to which the attention of his class must be directed by the teacher.

Examples of Teaching:—

1. Suppose the teacher wishes to show his class the effect of heat upon solids and liquids, he may perform the experiment illustrated by Fig. 1.

At first, after applying heat, the water is noticed to fall slightly in the tube; after a few seconds and after further application of heat, the water will begin to rise, and will continue to do this with the continued heightening of the temperature of the water in the vessel. In this experiment the immediate effects are apparently contradictory. Something has escaped the notice of the class; the rising of the water in the tube is clearly due to the expansion of the liquid under the influence of heating. This effect is noticed, and will be stated at once by the class in answer to the question, 'What do you observe?' The cause also of what they observe may be obtained from the class, for the only change of condition has been the application of heat. It will be necessary for the teacher now to call the attention of his pupils to the fact that the glass vessel would first show the effects of heating; if it expand, then the vessel will hold more water than at first, and this expansion of the glass will manifest itself in the slight lowering of the water in the tube. In this way our experiment has taught two truths—(1) that heat causes water to expand; (2) that heat also causes the glass vessel containing the water to expand. The first truth, both as to effect and cause, follows directly from the experiment, and is entirely worked out by the class by means of observation, reasoning, and of statement, stimulated and guided by the questioning of the teacher. The second truth, so far as effect alone is concerned, is observed and stated by the class; but careful direction and statement on the part of the teacher are required before the cause of what they observe is made clear to the minds of his pupils. Suppose, further, that a number of experiments

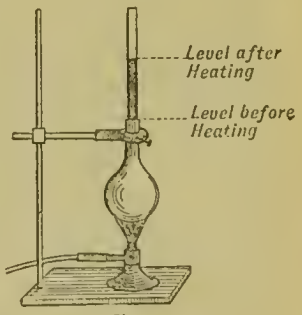


Fig. 1.

are performed in order to show that whenever heat is applied to solids and liquids the same result follows. The general truth '*that heat causes solids and liquids to expand*' will soon be established in the minds of the pupils, and should find expression from them in the truth or law just enunciated.

2. In order further to assist in distinguishing what must be told by the teacher from what may be found out and stated by the class, the example of teaching followed on page 88 may be quoted. When the functions of the Pronoun had been taught through the examination on the part of the pupils of many examples selected by the teacher, and when these functions had been stated by the class, then the new term 'Pronoun' was immediately supplied *by the teacher*, whilst its definition was made *by the class*.

3. An instance of the attempt frequently made to lead children to state what the teacher should tell will complete our examples. By a careful examination of numerous sentences, under the direction of the teacher, the distinction between the word or group of words which indicate the doer of an action, and the word or group of words which denote the action, has been established in the minds of the children; instead, however, of immediately associating the terms *subject* and *predicate* with each group of words respectively, there is interposed an attempt to train out these words; the children are asked to state the name we use of a book to signify, 'what it is all about;' or they are told to think of hearing a sermon, and to name the topic about which the preacher discourses. In this way the various uses of the term '*subject*' are introduced as though their introduction could in any way be made helpful to the association of the word 'subject' with its technical application in grammar. Instead of assisting the child to the right use of the terms Subject and Predicate, this method confuses him, and by the time the term is supplied its grammatical value has become much weakened, if not entirely lost. **As soon as the children have seized a new notion, let the teacher immediately supply the term associated with it.**

Summary of the chief conditions of stating the matter of a lesson:—

1. *That children should be encouraged to state fully* what they know already, and what they observe during the progress of a lesson.
2. *That the teacher must be ready to state* those conditions and those facts which may fairly be expected to escape the notice of his pupils, or may be beyond their knowledge.
3. *That whilst the teacher collects and arranges his facts and his examples*, the children must be led to compare and to classify them, and also to announce the results of their comparisons and reflections.
4. *That children should tell the teacher all they observe in an experiment*, and, under the guidance of the teacher, be led to state the less obvious effects, and, further, by processes of reasoning, to connect these with their causes.
5. *That the lessons should in all cases be an admixture of illustration, questioning, and statement judiciously distributed and arranged by the teacher with the hearty co-operation of his class.*

QUESTIONS: THEIR PLACE AND POWER.

A question when put by the teacher to a group of children assumes more or less knowledge of the subject with which it deals, on the part of the class, and its effect should be to rouse the scholars to use the knowledge they have for the following purposes, (1) of making it more perfect, (2) of associating with it other and less familiar matter, and (3) of acquiring information that is entirely new. Questions intended to recall matter previously taught are easily formed, and are named, with slight variations of meaning, **Tentative, Revision, Recapitulation,** and **Examination questions** respectively. Questions which serve the purpose of exercising the mind in finding out wherein its knowledge is faulty, in supplementing knowledge that is incomplete, and in accumulating fresh knowledge, are termed **Educational.**

1. **Tentative questions** are used at the beginning of a lesson, and at every new departure during the progress of the lesson; they are used to discover the amount and character of the knowledge already possessed by the class. As the teacher cannot be sure of any individual scholar being able to answer them, they ought to be put so that any child may show his ability to answer by show of hand. Tentative questions should be few, and be rapidly completed.

2. **Questions of Revision** are asked at the end of each stage of the lesson, and should be put so as to review the information taught in the order in which it was originally acquired; in this way the associations of matter first formed are still further strengthened, and, as a consequence, the permanent retention of knowledge and its ready recovery are aided. It is further necessary to revise before the amount of matter taught becomes too great, for if delayed very long the first impressions become weakened, and may possibly be lost altogether. This is evident when a teacher, during revision, finds it necessary to help his class in their attempts at recovery.

It is a truth in Mental Science that very few single impressions are permanent; at the same time, no one who frequently listens to lessons given by young teachers can fail to be struck with the fact that a really skilful revision is but rarely heard. This is due to many causes, chief among which are the following:—

1. The teacher has become very much interested in his lesson and feels it difficult to pause and thus stop the current of his own thought.

2. The class is stimulated to effort largely by the constant supply of what is new, and is found to slacken effort immediately they are turned back upon what is old.

3. The best place for the exercise has not been settled during the preparation of the lesson, and a suitable form of questioning has not been decided upon. This last cause of failure does not apply where experience has developed considerable skill in the art of questioning.

3. **Recapitulation Questions** are of the same nature, and have the same force as 'Questions of Revision.' They come at the end of a lesson, and thus form the final review of the matter taught.

4. **Examination Questions** are set either over a wide range of subjects, or upon a considerable area in any particular subject. They are useful as a stimulus to thorough review on the part of the pupil, especially when the range of matter is not great; and they further serve to bring out the ability of the pupil, particularly if they are framed with the view of requiring an application of knowledge acquired rather than a display of facts which have been committed to memory. When, however, the range of topics is very wide, and the questioning is satisfied with an exercise of memory, the examination becomes of doubtful value, and sooner or later cultivates 'cram' of the worst kind.

5. **Educational Questioning.**—This is the form of questioning most important to acquire, and very difficult to describe. It assumes great variety of forms, changing with every lesson and with every teacher. In common with the modes of questioning already described, it rests upon knowledge which the children have previously acquired, but differs in that it is used chiefly to advance to further knowledge, and to arouse in the class mental effort of the highest order. The successful answer to such questioning demands, it may be, the new association of notions already familiar in their separate condition. In this case both *memory* and *imagination* are exercised. Frequently it requires the arrangement of like facts and examples so as to arrive at a new, or an extended and generalised truth, thus calling into activity (1) the *judgment* in the arrangement of classes of facts, and (2) the *reasoning power* in arriving at, and in formulating the new truth.

The term **Socratic Questioning** is applied to the method of interrogation which endeavours (1) to get the pupil to see his own ignorance, (2) to awaken in him a desire for knowledge, and (3) to lead him to discover truth for himself.* These Socratic questions are a form of Educational questioning.

* Gladman.

Stages through which a class may be conducted to a definite mental result by the process of educational questioning.

Stage 1.—Questions are addressed to a class of various degrees of difficulty. If a question refers to something familiarly known, either by reason of the children's observation, or as the result of previous teaching, it may possibly be answered by all. On the other hand it may refer to something entirely new and be answered by none.

These extremely easy and extremely difficult questions are not without their use. They serve to guide the current of thought into those channels into which the teacher desires it to flow; they also serve to introduce a new topic or to recall knowledge to be again made use of; on the other hand, the too difficult question may serve to show the teacher the limits and extent of the children's knowledge. **Between these extremes, questions of any degree of difficulty may be asked. These intermediate questions constitute the first step in the educative process** by which the intellectual result is to be obtained. The answer given to such a question will be an *indiscriminate* one, and the teacher should resort to any device at his command which will encourage the children to attempt a reply.

The chief purposes which such answers as these serve are (1) to keep the advanced and brighter members of the class active, (2) to encourage thought amongst them, to promote a kindly form of emulation, and (3) to carry on the process of instruction in a manner more interesting to the children than could be done by stating each successive point in the lesson as a separate proposition. In most cases, if the questions are not unreasonably difficult, perhaps an answer will be got from half-a-dozen children. This answer may be right or wrong, and must be dealt with accordingly.

Stage 2.—**In either case the second part of the process now begins,** and the purpose of it is to correct what is erroneous, to complete what is partial in the children's knowledge, and to render the information and thought of the few the property of all. Merely allowing the children a little more time in order to dwell upon what has just been brought before them is sometimes sufficient. This may be done by simply inverting the answer given, and by making an ellipsis for the children to fill up, or by asking the question again in simpler form, taking care to avoid an unvaried repetition of the original question.

This process of simplifying terms, of allowing time, of varying the mode of presenting a question, is in itself an educative one, though of a very simple kind. If it is found to succeed, and an answer got from all, or nearly all, the purpose is answered, and the teacher may proceed to the next point in the lesson. But if this prove insufficient, a condition of things easily told by the sparseness of the answers, then—

Stage 3.—**The third stage of the process begins,** in which the teacher resorts to a process of exposition in which familiar illustrations of the topic under consideration must be employed. These illustrations may take the form of a comparison stated verbally, the exhibition of a picture, the use of a diagram, &c.

> It should here be observed that failure at this stage is frequently due to the illustration used being familiar enough to the teacher but not equally so to the class; or it arises from the illustration being taken from a text book, and not fully assimilated by the teacher's own intelligence. Having by this process simplified the topic, turned it over before the minds of the children, and presented it in various aspects to the pupils' thought—then if by any or all of these means the teacher has been successful, the knowledge at first possessed by a few has become the property of all, and we at once arrive at—

Stage 4.—**The final stage of the process.** The teacher reverts to the point originally started and answered first by a few indiscriminately; he presents it again in the form of a direct question, and answers ought now to be obtained from all, or nearly all, the children under instruction. The degree in which this is secured is the test of the success in previous parts of the process, particularly the illustrative portion of it.

If the process has failed what is to be done? Obviously, however great may be the demand on the teacher's patience, the illustrative work must be done again, and its success again tested in the manner described. Practically, however, with a teacher of moderate skill this does not often occur. Every successful point in a lesson which is felt to be important should be thus brought out by answers spread as widely over the class as possible. In this way the new matter taught becomes fixed, and the lesson is most effectively prevented from degenerating into a lecture.*

Examples of Questioning by which various Intellectual Powers are Exercised.

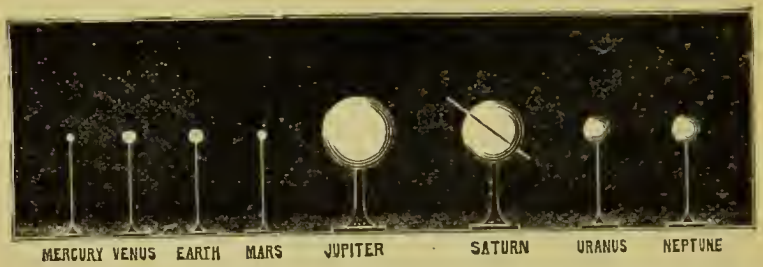
(*a*) *Exercise of Memory.*

> If, for example, I ask a class to tell me what they have learned in a previous lesson about the earth—as to its shape, its size, and its movements—I shall receive in reply a number of facts which have been stored in the mind, and are now reproduced by an effort of *memory*.

* From MS. notes of lectures by the late Mr. Sugden, B.A.

(*b*) *Exercise of Observation and of Judgment.*

I proceed to make these facts the basis of a lesson on similar bodies in the solar system, selecting Mars because of its many points of similarity to our earth, and Jupiter on account of its points of contrast.



I first direct attention to some simple balls, constructed so as to illustrate the relative size of these heavenly bodies, and placed so as to show their relative positions from the sun. A few moments are allowed for observation on the part of the class, and then the teacher asks one of its members to state what he notices about the distance of these objects from the sun; another is asked to state what he observes about their sizes. In this way he obtains, in answers from the class, 'that Jupiter is further from the sun than either the earth or Mars,' and that 'whilst Mars is less than the earth, Jupiter is much larger than either.' The questions in this case have exercised and directed the *observation* of the children, and their answers indicate that they have made successful efforts of comparison, thus calling into action a simple form of *judgment*.

(*c*) *Exercise of Memory and of Judgment.*

More information is now supplied by the teacher—'that Jupiter rotates on its axis once in about 10 hours, whilst Mars takes 24½ hours, and the earth about 24 hours. A question is now of service requiring the scholars to calculate the length of day on each of the heavenly bodies respectively. In their answers the children *associate* the length of day with the period of rotation. In the same way I may deal with the inclination of the axis of each heavenly body from the perpendicular to the plane of its orbit, and show by diagram or model that, whilst the axis of the earth is inclined 23½°, that of Mars is nearly 29°, whilst that of Jupiter is inclined only 3°. If a lesson on the earth's seasons has been given previously, a question will be sufficient to enable the pupil to connect the inclination of the axis of Mars with a similarity of seasons on both the earth and Mars, and also to contrast the seasons in Jupiter with those of the smaller planets. Groups of facts are in this way being formed, and are so arranged as to be easily *remembered*, whilst in the effort of arrangement there is an exercise and training of the *judgment*.

(*d*) *Exercise of Reasoning.*

Sufficient facts are now accumulated for the exercise of higher efforts of intellect, *e.g.*, if the children are led by a series of questions of revision to recall the many points of similarity established between the earth and its neighbour Mars—distance from the sun, period of revolution, length of day, their seasons; to which add that both have a surface covered in part with land and in part with water, and that both have an atmosphere—the class might now be asked to conjecture any other probable similarity. The answer 'life, animal and vegetable,' would manifest the ability on the part of the class to adopt the imperfect form of reason termed *analogy*. If, now, we take the three heavenly bodies under consideration, and require the class, in answer to our questions, to state the points of agreement amongst them all—revolving round the sun, and shining with reflected light—then ask them to distinguish these resemblances from the points in which they disagree, we get an excellent exercise of the *judgment*; and when we apply the name 'planets' to these heavenly bodies and further ask the class to define the term, then by the successful effort to answer the question we have aroused and exercised one of the highest intellectual powers possessed by our pupils, viz., that of *abstraction* and of *inductive reasoning*.

In the above sketch we have endeavoured to show how the skilful use of questions may awaken the class to the exercise of **memory and imagination**; to the formation of **general notions** and of correct **judgments**; and lastly, to simple exercises of the **reasoning powers**. The object of 'educational questioning' has been admirably summed up in the following remarks by Dr. Fitch. He says:—'Questioning ought to set the learners thinking, to promote activity and energy on their part, to arouse the whole mental faculty into action instead of blindly cultivating the memory at the expense of the higher intellectual powers. That is the best questioning which best stimulates action on the part of the learner, which gives him a habit of thinking and of enquiring for himself, which tends in great measure to render him independent of his teacher. The success of our teaching must be measured by the degree in which we have strengthened the judgment and enlarged the capacity of our pupils, and imparted to them that searching and enquiring spirit which is a far surer basis for all future acquisition than any amount of mere information.' *

THE ART OF QUESTIONING.

A. Introduction.—Seeing that questions form so valuable a feature in oral instruction, it becomes of the first importance that a teacher should acquire and develop the 'art of questioning.' There are many first class speakers who think clearly, and who can deliver a continuous discourse with great eloquence and

* The Art of Teaching, p. 29.

ease, who, nevertheless fail entirely when they attempt to question a class of children. The reason of this is found in the fact that they have not received the necessary training. This training involves the fulfilment of three main conditions, viz. :—

1. The power to think logically and to state clearly.
2. Good models of the art of questioning for imitation.
3. Practice in the actual effort of teaching.

Other things being equal, those with wide information make the best teachers; at the same time there are others whose stock of knowledge is limited, but whose skill in questioning and in communicating obtained by imitation of good models and by abundant practice, is such that they teach with much success. It is further important that a teacher should begin to embody his thoughts in interrogative expression early in life before other modes of speech have become set and habitual.

B. Features of good questioning.—

1. *The language of a question should be* SIMPLE *and* FAMILIAR.—The ability to come down to the level of the scholar's knowledge and to embody our thoughts in the language of the child is of great value to the teacher. A pupil cannot be expected to answer readily and successfully if there is any doubt in his mind as to the meaning of the several terms of a question, or if his thought is expended to any considerable extent in grasping the meaning of the question as a whole.

2. *The question should be* DEFINITE *and* FREE *from* AMBIGUITY.—It is almost as fatal to good questioning that the scholar be in doubt about the point of a question as that he fail to understand its terms. As an example of questioning which results in leaving the mind in doubt the following may be quoted.

A teacher was recently giving a lesson upon the 'seasons.' Holding a rotating globe in his hand, he said, 'You see these two pegs, one at either end; well, the globe turns round upon the piece of wire joining them. Now, what is that piece of wire called which runs through the earth from pole to pole? *Answers:*—1. The telegraph. 2. The Earth's axis. The fault in the teacher's question in this example consisted in his confusing in its terms two distinct things, viz., the illustration with the thing illustrated.

When questions which are wanting in clearness of statement are frequently set, they result in the formation of a habit of guessing on the part of the children. Instead of being trained to expect only one reply to be correct, the scholars cast about for probable answers and supply any that may possess the slightest association with the question.

Whenever the teacher receives, in answer to his questions, erroneous replies one after the other until at last some pupil, either able to supply the deficiency in the question or fortunate in making a guess, gives the correct answer, and the teacher, pleased to be thus rescued from a difficult position, says, 'Yes, that is just the answer I wanted,' it will almost invariably be found that the teacher did not get the answer he wanted at first because he did not ask properly for it.

3. *When a question has been put in* SIMPLE LANGUAGE, *do not immediately proceed to* AMEND *it by introducing an additional fact or idea, or attempt to* REPLACE *it by a second question entirely different.—*

Questioning of the following kind is sometimes heard :—A distinction is being pointed out between the stems of grasses and those of trees ; the children are to notice the fact that trees have strong and solid trunks and branches, whilst grasses have hollow and for the most part slender stems. After showing the stems of various grasses, and a section of the trunk, or of a large branch of a tree, the teacher wishes the children to state in their own words the differences they observe. Instead of taking the grasses, and after examining the hollow structure of the stem and representing its structure by a diagram on the board, then dealing in the same way with the structure of a section of the trunk of a tree—exaggerating somewhat the peculiarities of each—thus continuing and deepening the sense of difference first gained by direct observation, and finally asking the simple and direct question, What difference do you observe between the cut end of the grass and that of the tree trunk?—instead of proceeding in this straightforward way, the following unskilful method of questioning is sometimes followed : 'You see the cut end of this grass stem and of this tree trunk ; tell me what difference you notice between them? You saw me cut across the stem of grass, and I want you to compare it with that of the tree trunk. What is the grass stem like?'

In this example there are two distinct questions. The first was quite correct, and if it had been allowed to remain in all probability it would have been correctly answered ; the teacher, however, thought that the comparison it demanded was probably in advance of his class, hence he proceeded to simplify his question, and instead of requiring a comparison between the two objects before the class he asks for the results of their observation of only one. Some of the children will answer the first question, some of them the second, and all will be more or less bewildered.

4. *Questions should be logically arranged.*—It has already been frequently urged in these pages that questions should be used chiefly for the educational effect which they are calculated to produce. In order that they may stimulate to intellectual effort of the best kind they should be arranged so that if the series of questions and answers were taken down they would exhibit a clear and consecutive narrative. In order to secure this sequence a thorough preparation of the lesson is essential. The best preparation is that of a thorough mastery of the entire subject, and a complete view of the leading features of the lesson arranged in their logical order; then, having acquired a facility in framing questions, it will be found that these will proceed in a well ordered sequence. A limited divergence from the prepared plan may be permitted in order to give any explanations which the children's answers may suggest, taking care, however, to bring back the class with as little violence to consecutive thought as possible to the next step in the lesson.

Whilst it is of the highest importance that the teacher should prepare the order in which the several portions of his lesson must be taken, and picture to his mind the probable course the children will follow at certain difficult and critical stages of the lesson, it should be remembered that nothing is more likely to render a lesson disconnected in thought and dead in delivery than the preparation of the actual questions to be set during the giving of the lesson. These must of necessity be controlled by the nature of the answers the children give; and as these cannot with certainty be anticipated neither can the consequent questions be determined. Furthermore, the teacher is in danger of becoming occupied in the effort of memory necessary to recall the precise form of the next question instead of concentrating his thought upon the answers of his class and the state of mind these answers reveal.

5. *Questions should demand a reasonable effort on the part of the scholar.*—It is as necessary that we avoid questions which can be answered with little or no thought, as that we carefully abstain from setting questions which no previous teaching justifies.

If for example a class of children have been told that London stands on the Thames; London is then compared in size with Liverpool, Glasgow, and Newcastle respectively; they are further told that the Thames carries more shipping on its waters than any other English port; that the river supplies most of the inhabitants of London with water, and that it carries away their refuse. With these facts before them the following questions may very fairly be set.

(*a*) *Good Questions.*

1. *Which is the most important of the following rivers:—the Clyde, Thames, or Mersey?*
2. *Why is the Thames so important?*
3. *Why is the Thames more important than the Tyne?*

The **first question** requires an exercise of *judgment* in order to decide upon the claim of the Thames to pre-eminent position; the **second** serves to exercise the *memory* in recalling and recounting the entire series of claims upon which the importance of the Thames is based; the **third** demands a comparison between the series of claims just enumerated, and those which a much smaller town and port would (*by inference*) invest the Tyne.

(*b*) *Faulty Questions.*

1. *Place the rivers mentioned in the order of their importance.*
2. *So we see that the Thames is the most important river. Is it not?*

The **first question** requires a further statement of facts before it can be answered; the **second** can be answered without awakening any effort on the part of the class.

ANSWERS TO QUESTIONS.

A. **Introduction.**—Nothing manifests the tact and resource of a teacher more fully than the readiness and skill with which he deals with the answers to his questions. What is the meaning of the word 'grazing' in the sentence 'the horses were grazing in the field?' asked a teacher. 'Eating,' answered a boy less anxious to be correct than to be first in reply. 'No,' said the teacher, passing to another child for a more correct answer. It was afterwards suggested to the teacher that the first boy's answer should have been utilised and not negatived. 'Yes, the horses were eating, as you say; but suppose you saw the same horses feeding out of their nose-bags in the street, you could not say then that they were "grazing." Think a moment; you have just read about these horses grazing in a field. What would be their food? *Grass.* Now tell me what grazing means.'

Children very rarely answer entirely without thought, and whilst we check the habit of guessing, and all hasty and ill-considered speech, we must take care not to discourage all effort on the part of our scholars by receiving as entirely wrong that which is in part correct.

The importance of insisting upon full answers to questions has already been urged. All broken and fragmentary utterance on the part of children must be discouraged, so that their answers may be of assistance to them in their efforts after complete thought and accurate expression.

To this intellectual result there may be added a disciplinary effect, if only we receive our replies from as wide a class area as possible; for whilst answers are accepted from the brighter members of a class, who are thus encouraged to maintain their leading position, it is very necessary that the slower members should be frequently stimulated to answer. In this way, the full advantage of emulation may be secured.

B. The Simultaneous Answer.—There are conditions of oral teaching in which the simultaneous answer is sometimes used, as, for example, when information has been supplied either by the teacher or some member of the class; the group of scholars is then required simply to repeat what they have been told. This form of answer has been termed the *echo;* its educational effect is not great, and hence it should not be frequently used. Simultaneous answering of any value can only be expected where the members of the class are nearly equal in attainment, where the teacher is skilled in his art and has complete control over the attention and the thought of his class. Under less favourable conditions this mode of reply is deservedly subject to much adverse criticism.

The chief disadvantages are these:—(1) Only the attentive children reply; (2) the teacher has considerable difficulty in determining those who do not answer; (3) instead of a distinct and definite statement with which the teacher can at once deal, there is frequently a variety of answers and consequently considerable confusion; (4) the dull are neglected, and the bright are not effectively encouraged.

C. Simultaneous intellectual effort *versus* the simultaneous answer of Mr. Stowe.

When trained teachers began to be extensively employed, it was supposed by some that they could teach large classes containing from 120 to 150 children as well as, or even better than smaller groups. The chief aim of the teacher of these large classes was to guide the entire group through a united and simultaneous effort to a common intellectual result. The teacher depended for success mainly upon two forces. (1) Upon his own power of graphic statement ('*picturing out*') and (2) upon the influence which children exert upon each other ('*sympathy of numbers*'). The success or failure of the

teaching effort was then gauged by the number of children who, at the conclusion of the process of training could join in the simultaneous answer. The main principles underlying their system of training were excellent and may be accepted with the utmost confidence as being fully in accord with the most enlightened educational doctrines—that a teacher should stimulate the mental effort of an entire group and guide their thought so that a large proportion of the class should be conducted to the same intellectual result is a fundamental condition of all successful class teaching, but the attempt to influence the group so that the words expressive of the common effect should be the same for an entire class, and should be obtained from all in the form of a simultaneous answer was rarely successful, and is to-day practically abandoned.

A number of children may be successful in a united intellectual effort, but they naturally express their thoughts in a variety of ways, and the different answers given by successive children furnish the teacher with new starting points for further training. These individual and varied answers furthermore are an encouragement to independent effort on the part of the members of the class.

D. Influence of the Individual Question and Reply.

1. *Upon the dull.*—Only in comparatively rare cases can every child be induced to attempt an answer by any amount of teaching skill ; children are always to be found who from constitutional dulness or habitual idleness cannot keep pace with their school fellows. Of course every teacher knows where to look for these, and it is well that such backward children should frequently have their attention quickened and tested by an individual question.

2. *Upon the clever.*—If in addition to this questioning of the dull the teacher now and then selects others less markedly deficient, and at intervals some of the advanced scholars, the result cannot fail to be beneficial. By these means the teacher will be saved from placing too high an estimate upon his bright and intelligent scholars, and will at the same time frequently discover where he needs to be more exact or more lucid even for these advanced pupils.

3. *Difficulty arising from desire to reply.*—Children who have followed the processes of thought by which a definite mental result has been reached, are sufficiently rewarded if they are permitted to state this result in language before their school fellows ; and further, this statement on the part of the pupils establishes more firmly the knowledge they have acquired, and tends to make it permanent. Sometimes, however, children who are anxious to show their knowledge need to be corrected for supplying answers before being asked. Frequent corrections of this kind tend to discourage effort ; the pupil feels disappointment when at every stage in which he has successfully worked others are permitted to exhibit their

knowledge, whilst his ability and industry remain without such public recognition. This difficulty is intensified when the same scholars are repeatedly selected to give replies.

4. *How to lessen the difficulty.*—The remedy here is to vary frequently the mode of reply ; sometimes allowing the scholars to manifest ability to answer by 'show of hands,' at other times selecting replies from various parts of the class by direct appeal. (See 'Modes of Reply.')

E. Elliptical Answers.—Disapproval of an extensive use of these answers has already been expressed in these pages on the ground that they do not sufficiently encourage complete utterances to thought; to this may be added the inducement they offer to guessing and giving answers which the immediate context suggests, rather than the whole sequence of thought demands. They are especially useless when they are degraded to half word replies. All that can be said in their favour is stated as follows by Currie :—

> 'Some use this kind of answering more than others; the ardent and sympathetic teacher uses it most, and succeeds best with it. He carries his pupils along with him, identifies his mental action with theirs, and withdraws his assistance just before the end, trusting that the impetus he has given them will carry them to the completion. It contributes remarkably to keep up the continuity of thought in a lesson. Altogether, the use of elliptical answers makes a lesson smoother and more flowing in its progress.'
>
> The following is an example of both good and bad elliptical forms of reply. By means of a paper model a teacher leads his class to see that $\frac{2}{4}$ of the paper strip is equal to $\frac{1}{2}$ of it. The two fractional expressions are then placed on the board, thus, $\frac{1}{2} = \frac{2}{4}$. The teacher then asks the following question : 'What must I do to the fraction $\frac{1}{2}$ to make it $\frac{2}{4}$?' 'Multiply,' says one in reply. 'Yes, I must multiply, but cannot you tell me what I must multiply?' The children hesitate, and in order to help them the teacher throws his question into the elliptical form, and says, 'In order to obtain the fraction $\frac{2}{4}$ from $\frac{1}{2}$ I must multiply its numerator and denominator by the same *num(ber)*.' The most useful answer is the part of the sentence underlined, the portion of the word in brackets and the word in italics are equally valueless.

F. Modes of receiving Replies.

1. When there is doubt as to the number who may be able to give an answer, the children should manifest their ability to reply by show of hands. Do not continue to ask one after another for these indiscriminate answers beyond two of those who can reply. The children are apt to think the answers previously supplied are wrong, and hence they are tempted to change their reply.

2. If the answers are for purposes of revision it is well to receive them from all parts of the class, and sometimes to select an entire row of children to reply in turn. This is especially stimulating to scholars who are apt to count upon their chances of being overlooked. These do not wish to be exposed as the only ignorant pupils in the class.
3. Children known to be backward and to need stimulus should receive frequent attention and be often prompted to reply. It is not well to ask for a show of hands and then habitually to neglect those who obey in order to require some one who cannot answer to make the attempt. This mode of taking replies is sometimes allowable, but not often.
4. When a class is under effective control the method of *mutual questions and answers* is of use for affording variety of exercise, for cultivating a power of full and complete expression, and for rousing the scholars to concentration of effort, first in shaping the question and subsequently in receiving and dealing with the answer.

THE TEACHER AND THE CLASS.

The following topics have already been discussed in these pages on Oral Teaching:—The matter of a lesson and its arrangement in a series of stages following each other in logical sequence; the method by which each item of information is brought within the knowledge of the pupil; how the effort to obtain this knowledge may be made a means of intellectual discipline and training; the best methods of statement on the part of the teacher, and the most effective modes of reply on the part of the class. In addition to these essential conditions of successful oral teaching there remain to be considered the *manner*, *speech* and *tact* of the teacher, and the *discipline* and *intelligence* of the class.

1. Manner of the Teacher.

(*a*) *Earnestness.*—This is one of the first requisites of a good teacher. He must feel that the success of his lesson is an object worthy his best effort; that he cannot afford to fail, for

that will rob him of the confidence in his own power which is essential to success. He ought to experience after every lesson that the satisfaction arising from successful and faithful effort is one of the chief enjoyments of his school life. The enthusiasm and evident enjoyment with which he opens out each new stage in his lesson, and the interest which he throws around the entire effort, are readily communicated to his pupils, amongst whom a corresponding interest and effort are thus awakened and sustained.

> No amount of information, of careful preparation, or of material for illustration will avail if the teacher be lacking in earnestness. On the other hand, there are many teachers whose information is limited, who, nevertheless, aided by an earnest and enthusiastic manner, arouse their classes to successful effort in a marked degree. When, however, a wide knowledge and an abundance of material are at the disposal of an earnest teacher the most favourable conditions for successful teaching are secured.

(*b*) *Activity*.—An amount of bodily movement is necessary in the effort of teaching. Having taken up a position from whence he can command a view of his entire class, the teacher, whilst maintaining this place for the most part, should allow himself a certain freedom of departure from that position. On no account, however, should he move towards his scholars until he is almost in contact with those in the front row, neither should he move from side to side without directly facing any portion of his class.

The *mental activity* of the teacher is of high value for the purposes of class teaching, and when it exists there will be sufficient bodily movement. He who without hesitation gauges the condition of his class from the statements they make, or from their look of mute enquiry; he who can immediately turn either their answers or their silence to effective account; he who takes in the mental condition of each scholar at a glance, and who applies the stimulus necessary for successful effort; the one whose mind is thus mentally active is the teacher most likely to be successful in arousing and keeping a state of mental activity in his class. Under such a teacher no pupil feels at liberty to be inert, all feel that they must do their utmost to succeed, not so much, however, from fear of the consequences following indifference and failure on their part, as from a feeling of sympathy with the mental brightness and activity of the teacher.

(*c*) *Thorough*, *patient*, and *considerate*.—Whilst bodily activity and mental brightness on the part of the teacher are of high value in stimulating the children to intellectual effort, it is necessary to remember that children do not all acquire knowledge at the same rate; hence with some members of the class it will be needful to repeat, with others to correct, and all will be benefited by a well-conducted review. Repetition, correction, and general review, however, may be effected without in any way reflecting upon the pupil who is slow, and without wearying those who are naturally quick. Let the clever state again for the benefit of the dull, and do not suppose that the patience and effort necessary to inform the weak are wasted upon the strong, for these frequently need to repeat that which they readily gain in order to prevent its rapid loss.

2. The Teacher's Language and Voice.

The youthful teacher should spare no pains to gain the power of expressing himself in simple and correct language. Children are great imitators, and in nothing is this more manifest than in the efforts they put forth to copy the style of speech, and, to some extent, the very words of their teacher. The oral lesson partakes of the purely conversational form of speech more than any other school effort, and is the exercise therefore which allows the most natural use of language. Thought is being awakened and knowledge is being acquired, thus the necessity for new language is being experienced, and it is especially important at such a time that the most apt and suitable terms should be used.

Correct speech is acquired by practice, and tends to become habitual in those who use it. To form this habit the teacher should seize every opportunity of conversing with those who speak well. Loose and slovenly forms of speech when frequently indulged in cannot be discarded at will; they are almost sure to manifest themselves during the progress of a lesson, particularly when full effort of thought is otherwise occupied. Reading choice books will be helpful to clear and simple statement, but nothing short of actual practice after excellent models can give facility in correct speech.

An agreeable **voice** is a gift, and its possessor is to be congratulated. By acquiring, however, a variety in expression, a voice less favoured may be made in a measure attractive. On no account should the voice be raised to an unnatural pitch, or assume a slow and monotonous drawl.

3. Tact and Discipline.

Tact is a term of wide meaning. It is, however, specially applied to the ability a good teacher manifests for readily and successfully dealing with the unforeseen difficulties which arise during the course of a lesson. Tact in this sense is the result

of a full knowledge of the subject under discussion, a thorough insight into the pupils' mode of thought, and an ability to utilise the wider knowledge possessed by the teacher in order successfully to deal with an unexpected line of thought started by some member of the class. Tact in *managing* is as important as tact in teaching. During the giving of a lesson this form of tact is seen when the teacher secures the entire attention of his class, by the judicious distribution of his questions, and by the interest which his subject arouses and his manner secures. These should be the chief aids to discipline which the teacher introduces during the course of his lesson. Nothing is more likely to mar the effect of a lesson than frequent interruptions for the purpose of individual reproof.

4. The Intelligence of the Class.

The aim of the teacher should always be two-fold—(*a*) To impart information, and to lead children to gain knowledge; (*b*) To secure the exercise and the development of the mental powers.

The latter result is by far the most important. This truth has constantly been urged throughout the preceding pages. It is necessary here only to recall, by a brief summary, the powers of intellect which the teacher must train, and the means most likely to secure their successful exercise.

(*a*) By bringing objects and experiments wherever possible before the scholars, to stimulate and direct **their observing powers.**

(*b*) By arranging the matter taught, so that by the associations of similarity, contrast, and logical sequence, aided by repetition and an aroused interest, **the memory may be exercised and strengthened.**

(*c*) By means of graphic descriptions, assisted by picture and model, to lead children to re-group their mental images, and to realise knowledge which is outside and beyond their actual experience. **In this way the imagination may be aroused and developed.**

(*a*) By taking the knowledge which children learn by the effort of direct observation, which they retain by the action of memory, together with that they elaborate by the effort of imagination, and by classifying this knowledge to lead them to discover generalised and abstract truth. In this way our pupils may be gradually conducted towards and into those processes of thought termed **Conception, Judgment, and Reasoning.**

THE CRITICISM OF A LESSON.

A. Introduction.—When a teacher who is learning his art has made a careful and complete study of the best modes of preparing his lessons, and has exercised his own skill in giving them, he may join in the criticism of lessons given by others with great advantage to himself. The value of the exercise is due to the following amongst other reasons:—

1. *The observed lesson is generally a good one.*—The lesson is given under conditions likely to secure the best effort of the teacher giving it, and no teacher who is interested in his own work ever observes that of another (especially if that effort be his best) without deriving some benefit from the exercise.
2. *The hearer is free* to follow the lesson as it is developed by the teacher, and is also at liberty to watch its effects on the class. It is no doubt true in teaching as well as in other arts, that 'the way to do a thing *is to do it.*' No amount of observation of good teaching alone will make a brilliant teacher; but it is of undoubted advantage sometimes to see teaching by others. In giving a lesson himself the teacher's mind is absorbed in the very complex effort in which he is engaged. He cannot, as he proceeds with the lesson, make full and reliable records either of his work or of its effects upon the class. He knows, of course, when he succeeds, and can afterwards record the conditions of success; he also becomes acquainted with failure at any stage of his lesson, especially if, after patient effort, he turns failure into success. When, however, either success or failure in the teaching of others is observed by us, and we are completely at liberty to trace the entire course of teaching by which either is brought about, the experience becomes ours to the fullest extent, and will be a permanent addition to our professional knowledge. This excellent result will the more likely follow, if, in our own teaching, we strive to avoid the errors which brought about failure and adopt the methods which were crowned with success.
3. *The effort to state* the connection between the effort of successful teaching and the conditions which secure success, and also that between failure and its cause, is one which demands concentration of thought, the exercise of the reasoning powers, and a good knowledge of both teaching processes and the principles upon which they rest.

B. In what a criticism consists.—Lessons which have been carefully prepared under the knowledge that they will be subject to criticism are not likely to be altogether faulty; at the same time there are very few lessons which are in every respect excellent. Faulty and excellent features are found in most criticism lessons, though the proportion between these varies

considerably. The critic should be ready to recognise both. Simple recognition of them, however, is not sufficient, for we may be able to tell where the lesson we have heard is right and where it is wrong, and not be able in a single case to state the reason for either success or failure.

> There are few more valuable and fruitful truths for a young teacher to learn than this, that whenever in hearing a lesson he witnesses a failure without being able to account for it, he is defective in his professional knowledge, and whatever he may say in criticising his fellow teacher, he is in that condition of ignorance most likely, when occasion serves, to manifest the very errors which he exposes in another. A criticism should aim therefore not only at revealing what is faulty and at stating what is excellent, it should accompany each with reasons, and should also, in the case of faulty teaching, suggest a better method.

C. Faulty Criticism.—As a rule the teacher who can give a good lesson himself is able also to criticise with credit a lesson which he hears given by a fellow teacher. The errors most frequently committed in the effort of criticising a lesson are as follows :—

1. Stating what is good in a lesson without showing wherein the value of the method of teaching rests.
2. Stating faults in teaching and failing to show how each fault arises, and how it may be corrected.
3. Criticising only the mistakes, either of method or of information, and omitting altogether to mention the good points in the lesson.
4. Attempting during the criticism to cover too much of the lesson, and failing to deal with any portion thoroughly.
5. Emphasizing petty details, such as faults of speech and mannerisms, too much, and omitting altogether a broad review of the arrangement of the parts of the lesson, or the general educational effects of the lesson as a whole.
6. Attempting to enter upon the criticism of the lesson given by another without sufficient preparation of the lesson by the critic himself.

D. Aids to criticism.—The teacher who is learning the art of criticising will, at first, find a 'criticism form' of considerable service if only he remembers that he is to use it simply as a means of recording and arranging the main features of the lesson. He must on no account allow himself to become its slave by reason of the mechanical and rigid form into which the 'outline' registers all lessons alike. The 'criticism form' which each teacher devises for himself will be the best; the following form is one which has been used with advantage, and is presented here for the guidance of those who are beginning the exercise. It is only suggestive, and should not be slavishly followed.

Criticism Form.*

Subject of Lesson School and Class ..... Date .....

Matter and Plan.	Method.	Criticism on Matter and Method.
1. 2. 3. 4. 5. 6. 7.		
Teacher. 1.—Manner 2.—Language 3.—Revisions	4.—Questions 5.—Illust. (*a*) verbal (*b*) pictorial	Class. 1.—Discipline 2.—Interest 3.—Intelligence General Results.

* Should be enlarged to the size of a foolscap sheet.

E. The criticism of a selected portion of the lesson.—When the entire lesson is criticised it frequently follows that no part is thoroughly done, and a habit of superficial criticism is formed. In practice it will be of advantage if a certain portion of the lesson be taken for more thorough criticism by different observers. The following statement summarises the most important features of an oral lesson under the four heads of—(1) Matter, its arrangement and suitability. (2) Illustrations, their kinds and value. (3) Questions and answers. (4) Work of the teacher and effort of the class.

The same arrangement may be usefully followed in forming divisions of a lesson for criticism ; at the same time the sub-divisions under each heading may prove of service to those who need direction in the criticism of the lesson under any of the selected headings, care being taken in every case that reasons be given for every statement made.

A.—*Matter of the Lesson.*

1. **Introduction.**—(*a*) Short and led quickly to the subject to be taught. (*b*) Apt, connected with previous teaching without carrying the class far from the subject of the new lesson. (*c*) Roused interest and the spirit of enquiry in the minds of the pupils.

2. **Character of the Matter.**—(*a*) Interesting and at the same time sufficiently difficult to rouse effort on the part of the class. (*b*) New, yet connected with that already known. (*c*) Sufficient, without being too abundant. (*d*) Selected with the object of informing the class, rather than that of exhibiting the knowledge of the teacher.

3. **Arrangement of Matter.**
   (*a*) *Each stage complete* and its parts arranged in logical order.
      1. From illustration known to knowledge sought.
      2. From examples to rules.
      3. From experiments to scientific truths.
      4. Completed before the next stage was attempted.

   (*b*) *The lesson as a whole.*
   1. The stages of the lesson exhibited a connected and natural sequence.
   2. Each stage demanded an equal effort and left a well-balanced result.
   3. The results of each stage were revised, and at the end of the lesson collected into :—
      (*a*) A definition in grammar.
      (*b*) A rule in arithmetic.
      (*c*) A principle in science.
      (*d*) A rule of conduct in moral training.

4. **Matter well prepared ; as shown by :—**
   (*a*) Its suitability to the class.

(*b*) By the teacher's readiness of resource in dealing with unforeseen difficulties.

(*c*) By the presentation of new knowledge in a well-balaneed admixture of *statement*, *illustration* and *questioning*.

(*d*) By being completed in the form prepared and in the time allowed.

5. **The abstract of matter well prepared, as shown by :—**
   (*a*) Its neat and orderly arrangement.
   (*b*) Headings of matter written in distinct character and numbered.
   (*c*) The omission of no points of importance, whilst small details and matter used only for illustration remain unrecorded.

B.—*Illustrations.*

1. **In the form of Statements.**—(*a*) Made in simple and graphic language, and familiar. (*b*) Whether ready when needed? or merely introduced because they had been prepared? (*c*) When one form of statement failed another form was available. (*d*) Varied by a fresh word, a simpler statement, or by references to etymology? (*e*) The scholars' minds were carried forward to the knowledge required.

2. **In the form of Examples.**—(*a*) Framed by the teacher? *or* by the children? *or* by both? (*b*) Varied enough to prevent the truth illustrated becoming too narrow? (*c*) Sufficient to establish fully the *principle* or *rule*?

3. **Diagrams.**
   (*a*) Whether drawn before the class and developed as the lesson proceeded? *or*,
   (*b*) Introduced in complete form?
   (*c*) The scale, and the mode of emphasising the important features in the drawing; use of colour.
   (*d*) Whether quickly and well drawn, and with pleasing effect? *or*,
   (*e*) Small, badly formed, and unattractive?

4. **Pictures.**
   (*a*) Sufficiently large to be seen by all?
   (*b*) Natural, and conveying accurate impression?
   (*c*) Attractive and arousing attention?
   (*d*) Stimulating the imagination to realise the object represented?
   (*e*) Beautiful and cultivating taste and artistic power?

5. **Objects and Models.**
   (*a*) *Objects*:—
      (1) Whence and by whom obtained?
         (*a*) By teacher? *or*,
         (*b*) By pupils?
      (2) How used?
         (*a*) Merely shown? *or*,
         (*b*) Handed to scholars?
      (3) Value for teaching.
         (*a*) Imparted knowledge.
         (*b*) Cultivated observation.
         (*c*) Exercised speech.

(*b*) *Models:*—
- (1) Bought, or made, by teacher?
- (2) Special features for special ends of the lesson.
- (3) Ingenuity in the design.
- (4) Effectiveness in teaching.

6. **Experiments.**
- (*a*) How many?
- (*b*) Necessary, *or* merely for show?
- (*c*) Skill displayed in manipulation.
- (*d*) Success in performance.
- (*e*) Observation of scholars.
  - (1) How awakened?
  - (2) How directed and developed?
  - (3) How tested?
- (*f*) Use made of the results of the experiments.
  - (1) A simple fact observed, *or*
  - (2) Sequence of effects traced.
  - (3) Reasoning exercised:
    - (*a*) Inductively in establishing a principle, *or*
    - (*b*) Deductively in applying and illustrating a scientific truth.

C. *Questions and Answers.*

1. **Introductory or Tentative Questions.**
- (*a*) Few or many?
- (*b*) Were they put briskly and answered smartly?
- (*c*) Did they serve to connect the results of previous teaching with present effort so as to arouse in the class—
  1. An anxiety to state knowledge already acquired?
  2. A feeling that knowledge was not complete?
  3. A desire to know more?

2. **Educational questions.**

Were these—
- (*a*) Sufficiently suggestive to direct thought?
- (*b*) Not so definite and leading as to control thought?
- (*c*) Not so difficult as to discourage thought?
- (*d*) Nor so easy as not to require thought?
- (*e*) Distributed so as—
  1. To sharpen the dull?
  2. Encourage the bright?
  3. Stimulate effort in all?
- (*f*) Did they follow each other in a logical sequence, and arise mainly out of previous answers?
- (*g*) Did they result chiefly in the exercise of the higher intellectual powers, or was the storing of information the more prominent effect?

3. **Questions of revision.**

Were these—
- (*a*) Introduced a definite stages of the lesson *or* all reserved for the end.
- (*b*) Arranged in the order in which the information had been imparted, *or* were they set without order? *Criticise the effect of the arrangement of questions upon the class.*

(*c*) Distributed over the entire class and over the whole of the matter taught?

(*d*) Did they reveal a satisfactory amount of knowledge acquired, *or* did they show how little was understood?

4. Forms of questions.

(*a*) Examples of—

Good Questions.	*Faulty Questions.*
Clear in terms,	*or* Vague in expression?
Brief in statement,	*or* Many useless words?
Pointed in meaning,	*or* Difficult to understand?
Required full answers,	*or* Single words, especially 'yes' and 'no'?
In teacher's own words,	*or* Copied from a book of lessons?

(*b*) The Elliptical question.

1. How used?
2. Value for teaching?

5. Answers.

(*a*) Correct by none,	(*a*) Fault of teacher? *or* (*b*) Fault of scholar?
(*b*) Correct by all,	(*a*) Sign of question being too simple? *or* (*b*) Of teaching being excellent?
(*c*) Correct by some only, incorrect by others.	(*a*) How received? (*b*) How corrected and extended? (*c*) With what success?

D. *The Teacher and the Class.*

1. Language.

(*a*) Choice, simple, correct, and free from provincialisms.

(*b*) *Speed.*—Sufficiently rapid to arouse effort; fluent, but not exercised for display.

(*c*) *Voice.* — Under complete command, neither monotonous nor loud; firm, but kindly and encouraging.

(*d*) *Bearing.*—A good position; a genial tone—without manifest disappointment at failure, and with evident pleasure at success.

2. Manner.

(*a*) *Earnest.*—His whole thought and effort thrown into the exercise.

(*b*) *Sympathetic.* — Especially with the slow and dull. Able to enter into their difficulties, and patient enough to help them over them.

(*c*) *Tact.*—Manifest in keeping all at work. The quick made to stimulate the dull. Unforeseen difficulties readily met.

3. The Class.

(*a*) The attention of all secured and maintained.

(*b*) Their thought aroused and exercised.

(*c*) Their knowledge increased.

(*d*) Their entire mental life excited and developed.

(*e*) The habit of work strengthened and the desire after knowledge awakened and satisfied.

NOTES OF LESSONS.

Introduction.—The ability to write good 'Notes of lessons,' even by those who have acquired considerable skill in the art of teaching, is somewhat rare, and there is danger in any attempt to teach this subject, from the fact that young teachers prefer using a good model to making notes of their own. In the following pages it is proposed:—

i. To point out some common faults in Notes of Lessons.

ii. To state the principles which should guide the young teacher in drawing up his notes.

iii. To present specimen Notes of Lessons in each of the subjects of school instruction, embodying the principles of teaching previously laid down.

iv. To briefly indicate the value of each subject for intellectual training.

The Notes of Lessons presented in this book are intended to serve as types only. Do not therefore copy them. Good original notes of lessons indicate a condition of thorough knowledge, and of a power of logical arrangement and of thought; but the reproduction of notes of lessons from a printed copy does not convince those who read them of either intellectual power or high moral worth.

COMMON FAULTS IN NOTES OF LESSONS.

1. The arrangement of all lessons upon one model.

Notes of a lesson are generally written in two columns, one of which is headed '**matter**' and the other '**method.**' This arrangement is a convenient one for many lessons, but it is not adapted to all. In an arithmetic lesson, *e.g.*, the column usually headed 'matter' consists of a series of examples and the truths they teach; it should therefore be headed '*examples*' and '*truths they teach.*' Similarly, in a grammar lesson, sentences and words supply the matter, and upon these, new rules and definitions are based: hence the heading in this case should be '*examples*' and '*rules.*' In a dictation lesson a

totally different arrangement of the lesson notes is needed, the matter consisting entirely of the selected spellings and the paragraph chosen for dictation, the remaining part of the lesson is best arranged under '*plan*' and '*mode of working.*' In a reading lesson the greater portion of the lesson would follow the arrangement suggested for the dictation lesson. It is evident therefore that a considerable variation in the arrangement of notes of lessons, and also in the terms used to designate the divisions of the notes is not only allowable but very desirable.

2. Portions of the lesson are written in far too great detail, whilst other parts are omitted.

In many notes of lessons the actual statements which the teacher intends to make, and the questions he wishes to put to the class, are inserted. The following paragraph is taken from actual notes of a lesson on the 'Manufacture of a Pen.' They illustrate the fault just mentioned, and are corrected below.

Heads.	Matter.	Method.
Hardened and Tempered.	They are hardened by being put into a box and heated until red-hot, and are then thrown suddenly into oil. This makes them very brittle, so they have to be tempered to make them elastic.	Refer to a pen, and ask the class to bend it; thus show its elasticity.

The matter in the above paragraph is too full, and is copied from a text book. The directions for teaching in the method column refer only to the concluding portion of the matter. The following is an amended form of notes for this portion of the lesson.

INFORMATION UNDER HEADINGS.	EXPERIMENTS AND TEACHING HINTS.
Stages in the Process of Tempering. 1. Heated red-hot . . . thus *softened.* 2. Plunged into water . . thus *made brittle.* 3. Gradually heated, and at a certain temperature plunged into water, and . . . thus *made elastic.*	1. Place a piece of iron wire in a Bunsen flame, or in a fire, and when red-hot allow one of the class to bend it. Contrast also with cold wire. 2. Perform this experiment—Contrast a brittle substance like the steel of a needle with soft wire like that of a pin. 3. With practice and careful preparation this operation may be performed. Direct attention to the change of colour on the surface of the iron before immersion.

3. Matter is frequently written with no indication of method and, *vice versâ*, the method of teaching is fully stated with no corresponding matter.

When a lesson is being prepared, an excess in the matter column is common ; but when the notes are those of a lesson which has been observed, the excess is in the method column. Both faults arise from a lack of power to discriminate between the information imparted, and the modes of presenting that information.

4. The frequent use of the terms :—'Educe,' 'Elicit' and 'Show' without stating how the matter is to be educed, elicited or shown.

It generally happens that the teacher has settled upon no definite plan of teaching at each of the stages where these words are used, and as a consequence the lesson proceeds by means of a considerable amount of vague and profitless questioning, and frequently ends in the teacher telling the matter which his notes state should be educed. The cure for this fault is never to use these words in the preparation of notes of a lesson without asking and settling the following questions :—How educed? how shown? Then state in the notes, 'educe by the following illustration,' or 'show by referring to experience,' &c.

5. The omission of diagrams and other forms of illustration when it is intended to introduce these into the lesson.

Sketches and diagrams are more difficult to produce than written statements, and are hence frequently omitted ; at the same time it should be remembered that these convey information in the most effective manner, they also brighten the appearance of the notes, and they secure an aptitude for diagrammatic representation, which is of the highest value in oral teaching.

6. The matter is not clearly arranged under headings and in separate paragraphs and no attempt is made by varying the size of the writing or by changes in the width of the margin to distinguish the more important matter from that of less value.

The faults here indicated are amongst the last to be corrected, and a considerable development of the logical faculty is needed before they finally disappear. When, however, notes are logically and graphically arranged, they are most helpful both in giving and in observing the lesson.

7. No blackboard summary is affixed to the notes.

The difficulty of summarising, which many youthful teachers experience is the reason for this omission. The difficulty, however, must be overcome, and this is best accomplished by practice. As the preparation of the lesson proceeds, and each paragraph of matter is settled, write a sentence which briefly sets out the matter to be taught ; when the lesson is completed, arrange these sentences in logical order, and cut them down to the

briefest intelligible form. Then arrange them at the foot of the notes of lesson, as nearly as possible as they are to appear on the blackboard at the end of the lesson.

Directions to be observed in drawing up notes of lessons.

The examples which follow will, it is hoped, serve to guide the young teacher in this important part of his preparation of a lesson. Some directions have already been given in the corrections of common faults. There are, however a few simple rules which may with profit be stated here, as they are applicable to nearly all lessons.

1. *Notes must be original.*

   It has already been stated that copied notes are positively weakening to the intellectual life and to the professional dignity of those who use them. Unless accompanied by wider reading and some original thought, the lessons themselves suffer. Such teaching does not awaken thought in the pupil, nor exercise thought in the teacher. The resource which depends upon full knowledge is wanting. The teacher avoids the manifestation of opinion on the part of his class, and they in turn remain intellectually dull, if not lifeless.

2. *They should be 'notes' and not essays.*

   Long and continuous statements, questions, and descriptions, are not in place. The knowledge to be imparted must be set out in brief phrases and sentences arranged in just sequence, and under suitable headings.

   It has already been stated that it will be found helpful if, in arranging the matter in paragraphs, the matter of less importance be indented and written in smaller handwriting. Again, matter which needs to have a very distinctive place in the lesson may be written in large style and to the full margin. Rules of arithmetic, definition in grammar, and principles in elementary science should be thus treated.

3. *Carefully distinguish the information from the method by which it is to be imparted.*

   This will follow if the information of the lesson is first determined upon, and the order in which it is to be given is arranged, and then if each item of matter is dealt with in the following way, viz., Ask the following questions:—How is this to be taught? by direct statement? by illustration? or by an admixture of statement and of questioning upon what has been told or is already known? Do not shirk this part of the lesson, nor be content to pass it over with words and phrases like 'question,' 'Draw from the class,' &c.

4. *Illustrate by Map, Diagram, and Sketch wherever possible.* Do not think this is time wasted. The careful sketch gives the necessary practice preparatory to facility and accuracy on the blackboard. Some teachers are much readier than others in this work; so important, however, is the power of rapid delineation on the board that those who feel they have least skill should seize every opportunity for exercising and developing what they have.

5. *Should indicate the best positions for revision and contain the blackboard outline.*—These are given a prominent position because they are very frequently omitted. Both revision and outline need careful consideration—the 'revision' for the purpose of a rapid mental review of a portion of the lesson, the 'outline' for permanent record of the entire lesson in note book for future reference and use.

LESSONS IN READING.

A. Introductory.—A young teacher is apt to consider himself able to conduct a reading lesson without previous study. The necessity for careful preparation becomes apparent, however, when the value of the exercise, as a means of cultivating the intelligence, is considered. A clear knowledge of the intellectual worth of reading will invest the lesson, not only with its importance compared with other school exercises, but at the same time, will afford guidance in its skilful preparation. The following is a brief summary of the more obvious intellectual powers which a well prepared and skilfully given reading lesson is calculated to exercise and train.

B. The reading lesson and Intellectual Training.

1. **Perception.**—In the earlier reading lessons the sight sense becomes trained to assist in the rapid recognition of the forms of words, whilst in more advanced reading, there is a developed power of almost simultaneous perception of the words in an entire phrase or sentence in advance, and this without serious demand upon the attention of the reader whose thought is necessarily occupied in gathering up the sense of the entire passage.* The variations of sound necessary for correct expression and for the interpretation of all the subtleties of meaning in an author, are under the immediate control of a well developed power of *hearing*.

2. **Memory** is exercised :—
   - (*a*) In the recognition of words and in their instant association with the sounds they symbolize.
   - (*b*) In recalling the mental images associated with each word immediately it is recognized.
   - (*c*) In retaining the substance of the matter previously read, in order that it may serve for guidance in the interpretation of the sentences which follow.
   - (*d*) Finally, in storing up, as a permanent possession, the new knowledge which the reading lesson supplies.

*The term '*intuitive*' is sometimes applied to knowledge in the shape of percepts which appear to be formed without manifest effort. Judgments, again, which are made without an apparent effort of comparison are termed '*intuitive*.'

3. **Imagination.**—Expressive reading is an exercise which depends for successful effort more upon a well developed imagination than upon that of any of the other intellectual powers. It has already been stated that intelligent reading is possible only so far as (1) the words become associated with correct mental images (*so far memory*), and (2) the new grouping of ideas, suggested by the order of the words, is effected by the aid of a well trained imagination. As an example of the effect of imagination in the reading exercise, suppose the lesson is a description of a battle scene such as that of the 'Balaclava charge.' The language used in the description may be quite familiar, and memory, therefore, readily presents to us the mental image with which each word is associated. Now the power of imagination asserts itself and becomes, by far, the most active intellectual force—for, by it alone, we arrange the images presented by memory in their new grouping and, in mind, construct a series of terrible conflicts whose scenes arouse our feelings to a state of remarkable activity—the feelings thus aroused stimulate, in turn, the imagination to heightened effort, until the fierce charge is reproduced, in mental effects, with almost the force and vividness produced by the sight of the original attack.

4. **Conception, &c.**—These higher intellectual operations are often demanded in the reading lesson and no opportunity should be lost for exercising them. When, for example, a general term like 'plant,' or 'mineral,' or 'ship,' is to be explained, the meaning should set out only those qualities which are common to the entire group of objects named. A ship may be described by a pupil as a structure made to float, to carry, and to be propelled by steam. Now, the last named quality is not possessed by all ships; the first two qualities being those only which can be so stated. These qualities, therefore, together, make the general notion, or the concept of which the general term 'ship' is the name. The pupil must be led to see his error and be conducted by careful teaching to the general notion or concept.

The need of careful preparation of the notes of a reading lesson should now be apparent, for the correctness of each of the mental images which the separate words or phrases of a reading lesson call up, enters into the correctness and fulness of the groups of images, or the scenes which the pupil's imagination elaborates, and these are still further enhanced by the vividness and reality of our own graphic descriptions. Let the young teacher, therefore, banish at once the notion that because he can read a narrative from the reading lesson fairly well, he can, therefore, without further preparation, teach the reading of it to a class of youthful pupils. Few lessons need more thorough and careful preparation than the reading lesson, and this preparation should manifest itself in carefully drawn up 'Notes.'

HINTS UPON DRAWING UP NOTES OF A READING LESSON.

Introductory.—The notes of a reading lesson should show the general plan the teacher intends to follow in giving his lesson. If, for example, the children are young, and are struggling with the mechanical difficulties of reading, it will be necessary to arrange for abundant practice in the art, and hence the simultaneous imitation of the teacher's pattern reading will form a prominent feature in the lesson; if, on the other hand, the class is an advanced one, the aim will be to develop independent expression of the thought and feeling of the author by each pupil. In this case, whilst the teacher continues to read as a pattern, he will carefully avoid the simultaneous effort on the part of his pupils, as this tends to a mechanical and monotonous style, and relieves the individual pupil from the intellectual effort which reading in the upper classes is intended to exercise and develop. The notes of the reading lesson will set forth:—

A. The Reading Exercise.

1. The divisions of a sample paragraph for the pattern reading of the teacher.

2. The imitation of the pupils, whether by *simultaneous* or by *individual* effort.

   If the former, the sample paragraph should be divided into suitable portions for imitation of the teacher's pattern by the children.

   The length of each of these divisions can only be determined when the degree of proficiency in the pupils is known. With very young children a phrase of three or four words would be sufficient; with advanced scholars, an entire sentence or a whole paragraph may be attempted.

3. Anticipated difficulties of pronunciation, of emphasis, and of expression, and how to deal with each. This portion of the 'lesson notes' may be arranged in the following way:—

Difficulties anticipated.	How to overcome them.
1.	1.
2.	2.

B. Explanation.

Besides the exercise of pattern reading by the teacher and that of imitation by the pupils, every reading lesson aims at increasing the knowledge of the class. No lesson, however, should be overcrowded with new words and novel experiences. The careful graduation of lessons, both as to language and ideas, should be a main feature in any reading book whose aim is the cultivation of reading.* Whatever book be used, the lesson selected will present some or all of the following points for explanation; and the notes of the reading lesson should state each point and how it is to be met:—

1. *Words* whose meaning is not fully known, and which the context does not sufficiently explain. These must be made familiar by careful illustration, accompanied by questioning and oral statement.
2. *Phrases and Sentences* which are complex in their arrangement, and which need simplifying by the discussion of their grammatical relationships.
3. *Secondary and subtle meanings* (especially in poetry), to which the pupils must be introduced, not so much by direct statement as by a gradual unfolding of the changes in meaning which the expression has assumed.
4. *New grouping of ideas*, in forming which the pupils will be aided by the exercise of a power of graphic description on the part of the teacher.

The interest and feeling of the reader will be awakened in proportion as he becomes familiar with the matter of the lesson, and hence any or all of the above processes of explanation will tend to arouse and stimulate these intellectual conditions so necessary to expressive reading.

Arrangement of the Notes of Explanations.

Words and Phrases and their meanings.	Illustrations and examples used (1) in explanation, and (2) in rousing the interest and intellectual effort of the class.
1.	1.
2.	2.

*The great advantage of a continuous narrative like 'Robinson Crusoe' for the reading effort, arises from the fact that novel conditions and new experiences are introduced in a gradual and natural series, and thus the knowledge gained in a previous lesson is available as a basis of instruction in the new lesson; moreover, by a lengthened contact with the persons of the narrative, the pupil's interest is maintained from lesson to lesson, and thus the feeling necessary to intelligent expression is readily awakened. In contrast with books in the form of a continuous narrative, are those containing selections of literary matter on a variety of topics. These are mainly valuable for the information they supply, or the literary excellence they present, together with the variety in style they contain.

*Specimen Notes of a Reading Lesson.**

A. Subject Matter.

'If the sea were a body of water in perfect repose it would be utterly incapable of effecting mechanical erosion. But every one knows that the sea is never absolutely at rest, and that, even in the calmest weather, its surface is ordinarily more or less troubled with waves. | It is easy to understand how these are formed. When you blow upon the surface of a basin of water, the mechanical disturbance of the air is immediately imparted to the liquid and the surface is thrown into a succession of ripples. In like manner, every disturbance of the atmosphere finds its reflex on the surface of the natural waters. | Each puff of wind catches hold of the water and heaps it up into a little hill with the face to leeward, then the crest falls and the water sinks down into a trough, as deep below the mean surface as the hill was high above it; but the next column of water is then forced up, only however to be pulled down again, and in this way the motion of the wave may be propagated across a broad expanse of water. | Drop a stone into a pond, and the same kind of action will be seen; the water all round the spot where the stone falls is first depressed in a little cup, and then rises again, the motion being taken up by the neighbouring water; and a succession of circles, each wider than the last, spreads over the pond, until the ripples at length die away upon the shore. | If any light object, such as a cork, happens to be floating on the surface, it will serve to indicate the motion of the water below. As the waves reach it the cork rises and falls, but it is not carried forward by the movement of the water. Exactly the same kind of action may be witnessed at sea. If a gull, for example, is seated on a wave it is simply locked up and down, and not moved onwards.'—*Huxley.*

N.B.—Only a sample sentence, marked by horizontal lines to indicate words and phrases needing explanation, and by vertical lines, to separate the amount of each reading effort, would be necessary in MS. notes.

B. Preparation.

(*a*) *Teacher.*

1. Mark the passages to be read as shown above.
2. Read over the sentences beforehand, in order to be familiar with them, and so as to be able to set a good pattern.

(*b*) *Class.*

Arrange the class an equal number in each seat, and let each scholar be provided with a book.

C. Pattern Reading by the teacher and imitation by the class.

1. Read, as pattern, the first division of the piece, exaggerating slightly the emphasis.

* These notes are intentionally made too full for MS. notes. The latter would be shortened by showing samples only of subject matter, of reading difficulties, and of explanations.

2. Call upon a good reader to imitate. Children imitate the successful effort of a fellow scholar.

3. Allow an inferior reader to follow.

4. Correct errors of pronunciation and emphasis. Mutual corrections are generally of little value, and should be allowed only as a means of maintaining continuous attention.

5. Allow a faulty reader to amend his first attempt, but do not weary the class by too frequent repetition of faulty reading.

D. Sample of Reading difficulties.

Expected and stated.	How to overcome them.
1. Lowering of the voice at 'repose' and making too long a pause at the same word.	Exaggerate the maintenance of the pitch, and call attention to the length of the pause in the pattern.
2. Failing to pause after 'never,' 'absolutely,' 'ordinarily,' &c.	Read first without, and then with the pause, and thus show, by contrast, how the pause affects the emphasis.
3. The pronunciation of the first 'a' in 'propagated,' the final 'g' in 'neighbouring,' and the aspirate in 'hold.'	These are common faults, which may be corrected by repeating the word, slightly exaggerating the proper sound of each letter wrongly pronounced.

E. Explanation.

1. The terms '*mechanical erosion*' and '*reflex*' are new, and may be explained before the children attempt the reading.

2. When either the context or previous instruction renders the meaning of a difficult term clear, it is better not to interrupt the reading for the purpose of explanation, but to take the 'explanation' as a distinct portion of the lesson.

WORDS AND THEIR MEANINGS. ILLUSTRATION.

1. 'Perfect repose':

Water with a smooth surface.

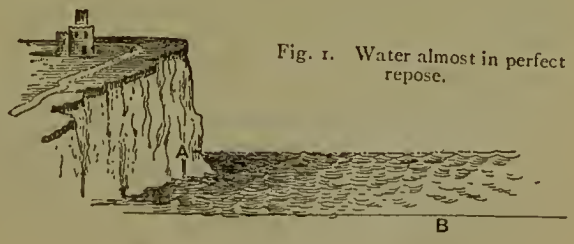


Fig. 1. Water almost in perfect repose.

The diagram on next page shows the wearing of rocks at A by the action of water.

2. **'Mechanical erosion':**

The wearing away of rocks by the action of waves, breakers, and running water. Contrast with chemical action as shown by dissolving salt in water.

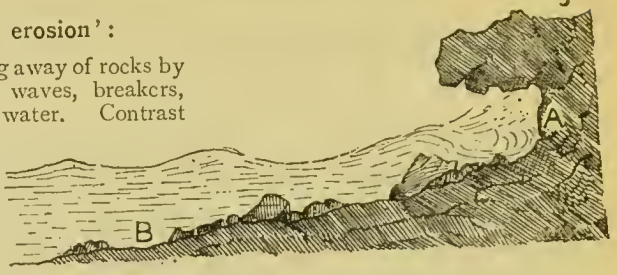


Fig. 2. Illustrating mechanical erosion.

This difference between mechanical and chemical action, when understood, will afford the best explanation of the term 'mechanical.'

3. **'Utterly incapable':**

Contrast water in a pool resting motionless against the bank with the action of breakers as illustrated in fig. 2.

4. The **mechanical disturbance** of the air finding its **reflex** on the surface of water:

Wind produces similar movements to its own on the surface of the water.

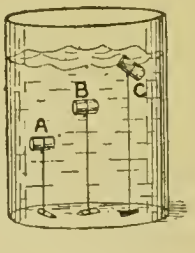


Fig. 3.

Blow across a vessel with corks at different depths; the cork on the surface moves with the disturbance of the surface water—an illustration of mechanical disturbance on the surface of water.

5. **Ripple, wave, breaker, crest, and trough:**

Each word is explained by the accompanying sketch. **Leeward** is the side of the wave away from the wind.

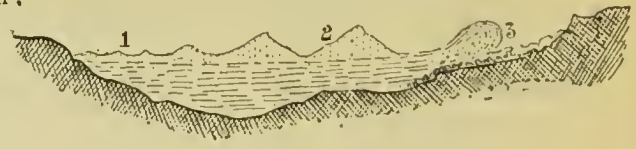


Fig. 4.

F. Continuation and end of the Lesson.

1. Each division of the lesson may be taken as directed above.
2. A revision of the new matter taught, the spelling, and meaning of difficult words, may be taken at the end of each 15 minutes.
3. Close the lesson by a general review of the subject matter in a conversational form.

WRITING LESSONS.

Introductory.—The art of writing forms an important element in all school instruction. Proficiency is obtained (1) by regular and steady practice, and (2) by systematic exercise.

To these two conditions of success applicable to all pupils alike, a third may be added in the form of inherited power. Every teacher is well acquainted with the fact that some scholars acquire skill in writing very readily, and in spite, it may be, of an entire absence of systematic instruction; at the same time the more usual experience confirms the truth that all may attain a creditable amount of skill by systematic instruction and steady continuous effort.

Systematic instruction in writing.—A writing lesson is frequently given by young teachers without any special preparation. Copy-books are distributed, and children are expected to imitate the copies therein set, but beyond the orderly distribution of materials and a careful supervision of the exercise, very little direction is attempted. When, however, the teacher begins to prepare his writing lessons with the view of teaching his class on a uniform plan, the need of a systematic arrangement of the entire course of writing, and of the several stages in a single lesson, is at once felt.

In order to facilitate systematic instruction in writing, the copy with engraved head-lines is being replaced in some schools by a regular system of class teaching from blackboard or cardboard copies. This plan has the advantage of securing the following conditions of successful teaching, viz. :—

i. The simultaneous effort of an entire class upon the same copy, thus arousing emulation amongst the pupils.

ii. The preparation of every lesson and the arrangement of a series of lessons on a definite plan by the teacher.

iii. The possibility of class instruction instead of the individual direction of the copy book lesson.

iv. The imitation of the teacher's copy; this copy, when well done, having a much more stimulating effect upon the class than the engraved heading.

Mulhauser's system of writing.—The following is a brief outline of Mulhauser's system. Those who do not adopt the scheme in its entirety will find the knowledge of the following sketch very helpful in the effective and intelligent class teaching of writing.

Introductory.—In the year 1829 M. Mulhauser was appointed Inspector of Writing by the Primary Schools Commission of Geneva. He found writing taught without any approach to method in the schools under his supervision. Copies were distributed for imitation, either in haphazard fashion, or in the alphabetic order of their initial letter. Children with remarkable imitative powers made satisfactory progress; but the majority made but slow advance. The art of writing correctly was acquired only after a laborious and long-continued effort. Mulhauser at once determined to place the teaching of writing in the schools under his control upon a rational basis.

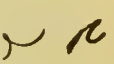
1. Analysis of script letters into four elements.—After careful analysis of all the small script characters, Mulhauser reduced them to the following four elementary forms :—

i. The right line down and up

ii. The curve down and up

iii. The loop down and up

iv. The crotchet



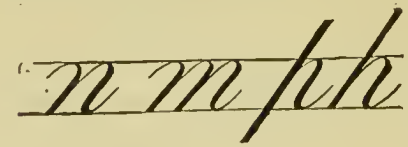
2. Classification of letters according to the elements composing them.—The twenty-six small letters were next arranged in seven groups, each with one or more of the above fundamental forms as the distinctive feature in the grouping.

The seven classes of letters.

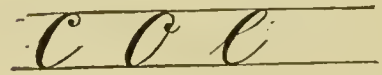
Characteristics of each class.

1. 

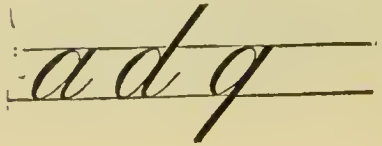
The right line with the addition of a curve at the bottom, called a '*link*.'

2. 

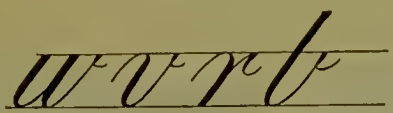
Introduces the '*hook*,' a curve in the opposite direction to the link. NOTE: *Both link and hook are chiefly used to join right lines.*

3. 

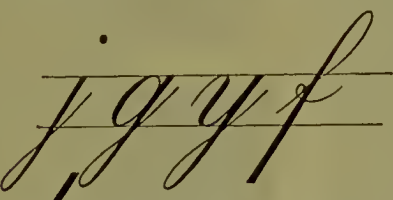
The new feature in class three is the '*curve*,' both down and up.

4. 

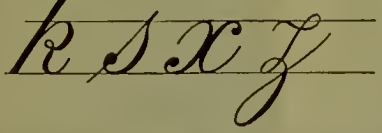
Union of the curved letter O with various right lines.

5. 

Introduces the '*crotchet.*' The other forms in these letters have been taught in previous groups.

6. 

Class of '*loop*' letters.

7. 

Complex letters.

3. Arrangements devised by Mulhauser for the systematic practice of the art of Writing.

By means of this classification the following conditions for exercising the art of writing were readily established in place of the haphazard arrangement of copies previously in use.

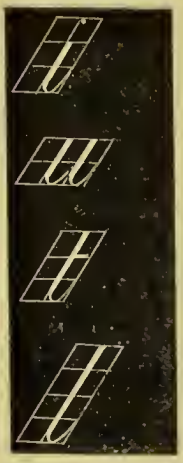
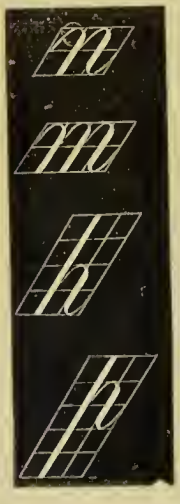
1. *From the Simple to the Complex.*—The simple forms—right lines—were first practised. New elements, such as the curve, the crotchet, and the loop, were gradually introduced, until the most complex letter forms were reached.
2. *Repetition without Mechanical Dulness.*—The practice of writing the simple forms in new combinations, and their recognition in these new shapes, supplied—
   (*a*) The repetition necessary for acquiring skill in the art of writing; (*b*) sufficient variety of exercise to stimulate effort.
3. *Regularity of Outline.*—In order to secure beauty and legibility through regularity of outline, Mulhauser devised expedients (Rhomboids) by which the exact shape of each letter could be determined, and the slightest error discovered and corrected.

   In these rhomboids the horizontal lines determine the height and the oblique lines the *slope* of each letter, whilst the middle horizontal lines fix the position of most of the *joinings*.

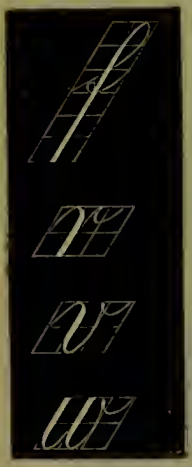
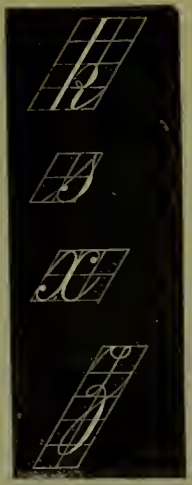
4. Names of Elements, and their Combination into Letters. (*Synthesis.*)

When Mulhauser had reduced the script characters to their elementary forms, and had classified them into groups in the order of difficulty, and had further devised his rhomboids so as to secure uniformity and legibility, he proceeded to name each portion of the letter forms. After these names have been thoroughly learnt, it becomes possible to build up complete letters and words from the dictation of their several parts.

The following is the complete script alphabet, arranged in rhomboids and in the order in which the letters are taught. The names of the elements are printed opposite the letters in which they are found.

Letters.	Description of Elements.
	right line ; link.
	right line, link ; right line, link.
	right line, 1½ heights ; link, bar.
	right linc, 2 heights ; link.
	hook, right line ; hook, right line ; link.
	hook, right line ; hook, right line ; hook, right line ; link.
	right line, 2 heights ; hook, right line, link.
	right line, 2½ heights, 1 height down ; hook, right line, link.
	curvc, link.
	double curvc, half crotchet.

Letters.	Description of Elements.
	loop, curve link.
	double eurve ; right line, link.
	double curve ; right line, 2 heights ; link.
	double eurve ; right line, 2 heights down ; half erotchet.
	right line, 2 heights down ; loop ; ½ link.
	double curve ; as for 'j.'
	hook, right line, link ; as for 'j.'
	right line, 2 heights ; link ; erotchet.

Letters.	Description of Elements.	Letters.	Description of Elements.
	loop, 1 height above; right line, 3 heights; crotchet.		right line, 2 heights; hook, ½-curve; ½-curve, link.
	hook, right line; crotchet.		link, to the height; 2 half-curves.
	hook, right line; link, crotchet.		hook, 2 opposite curves; link.
	right line, link; right line, link; crotchet.		crotchet, right line, hook; curve, 1 height down; loop, ½-link.

5. Combination of letters into words.

When the above letters are united into words, considerable difficulty is found when a hook follows a link. It should be remembered that in this case, instead of occupying two spaces, the two together occupy a space and a half. See fig. 3.

Similarly a half space is lost when *c* or *e* is followed by a hook. See fig. 3.

Fig 3.

As an objection to the system it is sometimes stated that the use of the new terms *hook*, *link*, and *crotchet*, *height*, &c., is a burden to the memory. In reply it may be stated that, in all, there are not above twelve new words to learn. For the method the following fact may perhaps be quoted. During five successive years one hundred and twenty student teachers per year were taught 'penmanship' upon the Mulhauser system, as worked out in a manual,* with the following result. With the exception of the students of one year the highest mark in the kingdom was regularly secured, and that with only one hour per fortnight devoted to the exercise.

Locke's method of teaching writing.

'When he can read English well, it will be seasonable to enter him in writing. And here the first thing should be taught him, is to hold his pen right; and this he should be perfect in, before he should be suffered to put

* Mulhauser Manual of Writing for Pupil Teachers and Students.

it to paper ; for not only children, but anybody else, that would do anything well, should never be put upon too much of it at once, or be set to perfect themselves in two parts of an action at the same time, if they can possibly be separated. I think the Italian way of holding the pen between the thumb and the fore-finger alone, may be best ; but in this you should consult some good writing-master, or any other person who writes well and quick. When he has learned to hold his pen right, in the next place he should learn how to lay his paper, and place his arm and body to it. These practices being got over, the way to teach him to write without much trouble, is to get a plate graved with the characters of such a hand as you like best ; but you must remember to have them a pretty deal bigger than he should ordinarily write ; for every one naturally comes by degrees to write a less hand than he at first was taught, but never a bigger. Such a plate being graved, let several sheets of good writing paper be printed off with red ink, which he has nothing to do but go over with a good pen filled with black ink, which will quickly bring his hand to the formation of those characters, being at first showed where to begin, and how to form every letter. And when he can do that well, he must then exercise on fair paper ; and so may easily be brought to write the hand you desire.'

Value of Writing.—The practical value of writing is very great, whether we consider the acquisition as a means of communicating knowledge or for the highly useful ends of business and commercial life. The educational value of the writing exercise mainly consists in the training of the eye to recognise regular and symmetrical forms, and the hand to a delicate and rapid power of manipulation.

The educational value is enhanced when a system of graduated exercises is presented, and when the means of rapidly correcting any departure from the recognised forms is given as in the rhomboids of the Mulhauser system.

Sketch plan of a collective writing lesson for junior scholars.

A. Matter of Lesson.

1. Letters consisting of right line and link.
2. Letters introducing the hook.
3. Words made up of letters taught in 1 and 2.

B. Preparation.

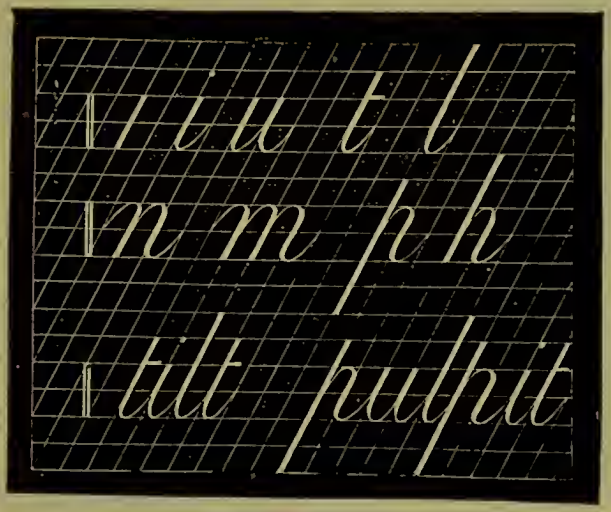
1. *Class.*—Arrange the class, an equal number in each desk, and cause each pupil to cover from the front row.

2. *Material.*—Distribute writing material—pens and books, or sheets ruled with horizontal and oblique lines—as shown on the sketch below.

A writing monitor should be appointed, whose duty it should be to place at the end of each desk a supply of books and pens. These, at the word of command, should be passed in an orderly manner to each scholar.

3. *Teacher.*—The teacher to decide the amount of matter necessary for one lesson, and to determine the special points in writing he intends to teach.

In this lesson the exact form of the '*right line*,' the lower curve called the '*link*,' and the upper curve called the '*hook*' are to be taught.



C. Preparatory Oral Teaching.

(*a*) Write the first line on the black-board under the observation of the class.

(*b*) Show by reference to the oblique lines on the board, that the right line is perfectly straight and is the same thickness throughout.

This may be further impressed by making an irregular stroke, and by asking the class to state wherein it is faulty.

(*c*) The lower curve (link) is exactly the same shape in every letter on the sketch.

Faults expected are—(1) The curve made too pointed or too flat, (2) The up stroke made too straight, so that if continued it would cut through the following down stroke. Show these errors by examples, and allow the class to detect and correct them.

D. Class exercise before Writing.

Before allowing the class to write, arrange each scholar in the exact position you wish him to occupy. Start the writing exercise by means of the following signals :—

'**One.**'—Each pupil at this signal should place his book or paper exactly in front of him, with the top and bottom edges of his paper parallel to the top and bottom of the desk respectively.

'**Two.**'—Each scholar to turn his left side to the desk and to place his left arm upon it ; the left hand to rest upon, and steady the paper.

'**Three.**'—Take up the pen and hold it out slightly in front.

The teacher seated at the table may do each of these movements for the imitation of the class. The steadiness or otherwise of his class at this point will be a fair indication of the kind of writing he may expect.

'**Four.**'—The children now dip the pen and proceed to write two lines.

E. Supervision of the Class.

The teacher must stimulate every member of his class during the writing effort. A careless stroke will spoil the copy. The children should be made to understand that every fresh line attempted must be an improvement upon the last. In order to do this :—

1. Move quickly round the entire class, pausing chiefly where careless writing is known to be probable.
2. Any observations the teacher directs to individuals may be in a sufficiently loud tone of voice to be heard by the entire class.
3. Whilst no fault is passed over without correction (by pencil), commend successful effort.

F. Correction of Faults.

Individual faults may be corrected during the supervision stage ; common errors require class correction.

1. Use a blackboard ruled as indicated in the sketch above.
2. Write the common errors in an exaggerated form, and allow the pupils to recognise and state them.
3. Write the corrected letter on the board as a model for the class.
4. When two or three common errors (not more) have been thus corrected the class to be encouraged to write two more lines—the last and best.

G. Close of the Lesson.

(*a*) By examining every book, shown in obedience to drill signals.
(*b*) If marks are used affix one to each.
(*c*) Books and pens collected in the reverse order of distribution.

SKETCH OF A DICTATION LESSON.

Class—Standard IV., Boys' School. *Time, 30 minutes.*

I. Preliminaries.

(*a*) Arrange the boys in the desks at equal distances apart.

(*b*) Distribute pens and paper.

The requisite number should be placed at one end of each row, and passed upon the word of command being given.

II. Preparation of Passage.

Unless the passage be taken from a lesson just read, ask the boys to spell the following words ; then write them on the black-board :—

1. Glasgow
2. Mathematical
3. Instrument
4. Steam engine
5. Structure
6. Devise

Impress these words further by allowing other boys to spell them.

III. Dictation of Passage.

(*a*) The boys first write the word 'Dictation' at the head of their papers. If necessary, give instructions as to the proper holding of the pen, and commence the writing exercise by means of the same code of signals as that used in the writing lesson.

(*b*) Read the passage through, and then dictate it once only in phrases as marked below.

> *Years afterwards,* | *when a young man,* | *he settled in Glasgow* | *as a maker* | *of mathematical instruments.* | *On one occasion* | *a small model* | *of a steam-engine* | *was sent to him* | *to repair.* | *This led him* | *to study its structure* | *and to devise* | *improvements on it.* |

Follow by half a dozen words selected from other paragraphs.

IV. Examination.

(*a*) Change books as follows:—The end boy on the right-hand of each row to pass his book to the left-hand boy of his row, and then return to his place.* The rest of the books are now passed one place to the right.

(*b*) Spell through the passage distinctly, allowing each boy to underline every mis-spelt word.

(*c*) Change back the books as above, only in reverse order.

(*d*) Write the most difficult words on the blackboard.

(*e*) Each boy to write his mis-spelt words correctly three times each under his exercise, and learn to spell them. The teacher to move quickly round the class, examining books, hearing spellings, and marking the exercises according to merit.

V. Conclusion.

Papers and pens to be passed to one end of each desk and collected.

* Vary the mode of changing books from time to time and frequently allow children to mark their own books.

DRAWING IN SCHOOLS.

A. Introduction.—The exercise of drawing has hitherto been optional in English schools. The consensus of opinion upon the value of the subject both for practical and educational ends, however, must soon necessitate the extension of the teaching of drawing to all schools, and throughout the entire school course.† The value of the drawing exercise has frequently been expressed in these pages. As an auxiliary to effective oral teaching its importance cannot be over-rated. A teacher with only moderate power of oral exposition is frequently saved from absolute failure by his skill in preparing a rapid and attractive sketch. No one, even though he may be of proved ability and experience in teaching, can afford to neglect this most effective mode of presenting knowledge.

> 'With reference to the subject of drawing, we cannot too often call attention to the extraordinary efforts which are being made abroad for instruction in art, more especially as applied to industrial and decorative purposes, and to the important influence of this instruction in furnishing employment for artisans on the continent. In nearly all the places abroad which your Commissioners have visited they have found that drawing is an obligatory subject of instruction in the primary school, and that it is regarded as of equal importance with writing. The number of hours which the children devote to lessons in drawing abroad is frequently as many as three per week, whereas, in England, it is not only not obligatory, but in three-fourths of our elementary schools no instruction whatever is given in the subject, and in those schools in which drawing is taught, the time devoted to it rarely exceeds one hour per week. Your Commissioners are of opinion that sound instruction in the rudiments of drawing should be incorporated with writing in all primary schools, both for boys and girls. Something in this direction has already been done in many good infant schools, where children of the age of six draw triangles, squares, oblongs, &c., on their slates. This exercise is repeated on the day of inspection, and is taken into account in estimating the value attached to "appropriate occupations."'*

B. The value of Drawing as a subject of School Instruction.—The twofold value of instruction in drawing is readily seen, but whether the usefulness of the art for the practical purposes of life, or the importance of the exercise for intellectual training has the advantage, cannot be so easily determined. In any attempt to decide this question, much of course depends upon the use which is to be made of the

† Drawing is now (1892) compulsory throughout for boys.
* Report of the Royal Commission on Technical Instruction, p. 519.

acquisition in after life. For most industrial pursuits a trained skill in drawing approaches in value the ability to write and calculate.

C. Value of Drawing in Intellectual Training.

1. *Observation.*—It is stated above, that if any distinction be made between perception and observation, it rests in the latter being a specially directed act by which, through the medium of one or more of our senses, we find out qualities and appearances in objects surrounding us, which, without this close and carefully directed inspection, would altogether escape our notice. The exercise of drawing is admirably fitted for securing this higher effort of observation. The results of this effort are twofold, viz.—(*a*) knowledge of material objects is increased in amount and is made more exact ; (*b*) a greater ability to observe is developed.
2. *Memory.*—The close associations struck between an object and its representation in a drawing afford most favourable conditions for the permanent retention of the mental image. In fact, all the conditions of a successful memory exercise are fulfilled in the operation of drawing. There is evident *interest* and the concentration of attention ; the frequent inspection of the object and the comparison of its appearance with that of the drawing afford *repetition* without weakening the interest ; lastly, there is the *association* of object with drawing, and both of these with the mental image.
3. *Imagination.*—Over and beyond the mere act of imitation, a pupil often develops his drawing into something which his fancy and taste approve. He produces effects by new and artistic combinations of outline and colour. Thus ability to reproduce develops into power to produce—the latter demanding, and at the same time exercising and strengthening, the imagination.

   Beyond observation, memory, and imagination, the constant comparison of the drawing with the original, and the final approval of the copy, are acts of *judgment*. The same intellectual power is called into higher exercise when deciding upon efforts stimulated by the imagination.

4. The purely educational value of drawing may be further extended by including (1) a delicacy of muscular action developed in the hand (2) the habit of concentrated attention, together with (3) a taste for the symmetrical in form and the harmonious in colour. Finally, habits of neatness, of order, and of arrangement are fostered, all of which bear good fruit in both work and conduct.

The value of this combination of educational effects is heightened still more, when it is remembered that they are all secured with so slight an expenditure of effort on the part of the pupil, that the drawing lesson is found to be a positive relief from the severer studies of arithmetic and science.

D. The practical value of drawing.

i. A drawing is the most effective presentation of form next to that by means of models and actual things.

ii. When objects, movements, or designs are on a very grand scale, or are very complex in form, a drawing frequently enables us to present the most essential features apart, and thus the drawing prepares for the reception of the complete idea or form.

iii. In industrial life, the power to represent by drawing is essential to most of those who plan out work for others, and ability to work from a set drawing is as frequently required of those who seek employment.

iv. Unlike the oral description, a drawing appeals to people of all languages alike.

v. The power to produce new forms and designs imparts additional worth to the individual and becomes a source of increasing wealth to the entire community.

The following is an outline of principles of drawing, and of methods based upon them, by Sir Philip Magnus in his work on *Industrial Education*. He writes:—

'A distinction must be made between *freehand* and *geometrical* or linear drawing. All children may, and should be taught a little of both; but some children show an aptitude for the former, which should be encouraged, and may be the means of determining their future occupation. There are many children, however, who have little or no artistic perceptions; and these, after having learnt the elements of freehand drawing, should be permitted to discontinue it for the more essential study of geometrical or linear drawing.'

Importance of drawing from natural objects.

'In order that drawing may yield its full value as a means of mental training, the pupil must be brought face to face with natural objects. It helps him little or nothing that he can copy *copies*. He must depict *things*. He must look at things till he knows them, and must acquire the ability to represent them on paper. There is this in common between science-teaching and art-teaching, that both should bring the pupil into immediate contact with nature. It is because drawing may be made the means of directing observation to the form of things that the teaching of it is valuable, apart altogether from the use which the pupil may make of the skill acquired. It is desirable, therefore, that the pupil should be taught from the very first to draw from natural objects. Much difference of opinion has been expressed as to the advantage of letting children commence by drawing from things; but the prevailing practice of the best foreign schools is found to fully support the views of educationists as to the importance of accustoming the child as soon as he can use a pencil or a brush, to draw from real objects.'

The use of a brush in drawing.

'And in teaching drawing the brush should be more generally used than it is at present. Children do not see things in outline, but as occupying a coloured portion of space. They should be taught to represent them as they see them; and should, therefore, be encouraged to draw with the brush in colour. Not only do they thus obtain a more adequate representation of the external object, but the exercise of painting is more interesting to the child than that of the outline drawing.'

Exercise in design.

'It has been shown by competent authorities that design can be taught more easily than has been generally supposed, and at a much earlier stage of a pupil's progress. With a view to the training of industrial artists, it is a matter of great importance that children should be early taught the principles of design. Much of the Kindergarten practice is exercise in design, and this should be continued in the elementary school. Children showing any special skill in drawing will afterwards apply that skill to the practice of the crafts, and will thereby add beauty to every piece of work that passes through their hands. Notwithstanding the great development of production due to the application of machinery to nearly every branch of industry, the taste and desire for handwork is on the increase. But such handwork, to be readily saleable, must bear upon it the impress of artistic skill.'

E. The Theory of Spencer and the Syllabus of the Science and Art Department.

(1) Mr. Herbert Spencer reminds us that a child loves to draw familiar and striking objects, and that it is especially delighted to have the use of colours and a brush. He holds that in these preferences the child indicates the natural and scientific method of teaching, viz., that for copies a child should have familiar objects, and that painting should precede outline drawing. He further states that 'the extreme indefiniteness which these first attempts exhibit is anything but a reason for ignoring them.' (2) The syllabus of the Science and Art Department:—Upon careful examination it will be observed that object or model drawing is not seriously introduced until we reach the exercises for Standard V. In order to interest the children, however, teachers are advised to encourage the practice of drawing familiar objects as early as possible. The brush finds no place in the entire course, but the drawing of objects and casts of ornament, in light and shade, is introduced into the work of Standard VII.

The standards of examination in Drawing are as follows, and they must be taken consecutively.

Standard I.—Drawing, freehand, and with the ruler, of lines, angles, parallels, and the simplest right-lined forms, such as some of those given in Dyce's Drawing Book. (To be drawn on Slates.)

Standard II.—The same on paper.

Standard III.—(*a*) Freehand drawing of regular forms and curved figures from the flat. (*b*) Simple geometrical figures with rulers.

Standard IV.—(*a*) Freehand drawing from the flat. (*b*) Simple scales, and drawing to scale.

Standard V.—(*a*) Freehand drawing from the flat. (*b*) Drawing from *rectangular and circular models*, and from easy *common objects*. (*c*) Geometrical figures with instruments and to scale.

Standard VI.—(*a*) Freehand. (*b*) Models of regular form and common objects. (*c*) Plans and elevations of plane figures and rectangular solids with sections.

Standard VII.—(*a*) Freehand. (*b*) Common objects and casts of ornament in light and shade, or geometrical drawing more advanced than Standard V. (*c*) Plans and elevations of rectangular and circular solids with sections.

N. B.—In order to interest the children it is advisable to teach them to draw as early as possible from actual objects such as the doors and windows, furniture and apparatus of the schoolroom. It will also be found quite possible and very desirable to go beyond the foregoing standards in teaching. Thus, freehand drawing of bold curves may be introduced in Standards I. and II.; and exercises may be advantageously given in all standards, in drawing from memory.*

F. Considerations helpful to a decision upon a Practical Course n Drawing.

It should be noted that Spencer says 'The question is not, whether a child is producing good drawings, it is, whether it is *developing faculty*.' Now if the development of the faculties of observation, of imagination, and of conception be the sole aim, then, the drawing of actual objects will, as has been shown on a previous page, very greatly assist. But this is not the sole aim. Drawing is also an art, which, like writing, needs to be acquired for practical ends. The exercise of drawing aims at training the hand to steady and reliable movement, and to give such a knowledge of the rules of the art, and such a skill in applying them, that both skill and knowledge shall, at an early age, be available in the service of the desk, the workshop, and factory. If now we leave out of account for a moment the culture of the intellect, and fix attention upon drawing as an art, then it is wise to follow the principle which applies in all cases where manual work is to be done, viz., to begin with the simplest exercises and as skill develops and acquisitions multiply, to proceed to more difficult and complicated forms of exercise.

The sound policy for those who must look upon the Drawing Exercise in its twofold aspects, viz., as a means of intellectual discipline and as a practical art (to be made available at an early age for purposes of a livelihood) is to arrange a series of exercises in progressive order, from the simplest lines to the most complex figures

* The reader should consult the Illustrated Syllabus of the above course issued by the Science and Art Department. Price 2d.

and artistic forms. At the same time it will be well to adopt in part, but very judiciously, the suggestion of Mr. Spencer, and allow objects very simple and regular in outline to be drawn. It is certainly unwise to keep children in a wearisome and monotonous manner, solely at the exercise of drawing strokes and curves from the flat, without attempting to connect these strokes and curves with the outlines of the familiar objects of the school and home.

A. Modelling in Clay.—A means of intellectual training.

In many infant schools, and in some upper schools, opportunity is afforded for operations in clay modelling. This exercise is designed especially to train the sense of sight and of touch—eye and hand. In drawing we represent objects by lines on a flat surface; the sphere, for example, is represented by a circle, with shading to give the appearance of solidity; the drawing, therefore, is an expression only of what the eye recognises in the sphere, *i.e.*, outline and distribution of light and shade; the model, however, is a complete reproduction of all the features of exact size and solid shape which the sphere possesses, and is, therefore, a much more real and concrete form of representation. At the same time that these fuller and more perfect notions of spherical form are being developed by the fingers and the hand, the eye is being exercised in taking in the appearances of light and shade which indicate that form. In fact, the movement of the hand in moulding the clay into the spherical shape is directed by the appearance the clay object presents to the eye, and when the eye is satisfied with the shape produced by the hands the modeller ceases to work. Intellectually the exercise is of high value for—(1) cultivating the powers of observation; (2) developing an appreciation of form; (3) fostering habits of neatness and order; and (4) forming a habit of attention with the least expenditure of energy.

The modelling of the sphere is largely aided by rolling on a board; when, however, the sphere has been satisfactorily modelled, it may be modified by the hands and fingers into a variety of shapes, as *e.g.* an *apple*, an *orange*, a *pear*, a *bird's nest*, a *cup*, &c.

In the same way a series of exercises may be developed having the cylinder as their basis, the allied objects being a *candle*, a *ruler*, an *egg*, *inkwell*, *drinking glass*, &c.

Unless these exercises be made means of *exact* observation, the educational value of the lesson will be but slight. At first the child makes a very rough attempt. The teacher's copy, worked out in the presence of the class, suggests further effort and stimulates to more successful work. When, however, the pupil has become satisfied with his result, the teacher will be able to indicate error in shape which had

escaped the child's notice. Fresh effort is aroused; closer and more exact observation is awakened and a finer discrimination of shape is secured. The intellectual advantages of the lesson in clay modelling will be due largely to the skill with which the teacher leads the pupil to the recognition of unobserved defects, and to the tact with which he stimulates the modeller to renewed and successful effort.

B. Practical value of modelling.—Besides the intellectual effects enumerated above, there should be placed to the credit of the exercise, a gradual growth of finger and hand power. This power needs early development, and unless practice is afforded whilst the fingers and hands are in a pliant condition, *i.e.*, before the ages of twelve to fourteen, the higher kind of manipulation is but rarely attained. When this power is developed it becomes of great service to the possessor when he takes his place in the workshop or factory.

The Royal Commissioners on Technical Instruction state in their report, that they 'are of opinion that more attention than has hitherto been devoted to it should be directed to the subject of modelling in the elementary school. Modelling is an exercise of great importance to the future workman, and its rudiments can well be taken up, as in Continental schools, at the earliest age.' One of the Commissioners (Sir P. Magnus) has also written in his work on Industrial Education to the following effect :—

'Modelling may be regarded as the complement of drawing. In its earlier states it is an easier, and is generally found to be a more interesting exercise. The first efforts of the pupil should be directed to the production in clay of a fac-simile of some simple solid object, such as an orange or a pear. The resemblance between the object and the clay model will be more easily recognized by the child than the likeness of the object to its outline on paper. In the production of the solid model there is a gratification of the sense of power, which affords the child more satisfaction and pleasure than in making a representation of the object on a flat surface. The training of the eye in appreciating form and size is very valuable, as is also the exercise of the hand in translating into the concrete the visual impressions. Any one who has witnessed the concentration of thought shown by children engaged in modelling, and their successive efforts to make their model similar in shape and size to the object before them, will realize the value of such lessons as sense exercises. Lessons in modelling may be easily graduated, and as the pupil advances he may be taught to model from ordinary drawings, producing in relief what he sees in the flat. The relation between an object and its picture will be best understood when a child can correctly depict the object on a flat surface, and can conversely produce a solid object from its pictorial representation. The skill acquired by modelling is of great practical use in the plastic arts, but as a subject of elementary education, its value is greatest as an educational discipline.

Modelling requires very simple and inexpensive appliances, and it can be taught with equal advantages to boys and girls.'

ARITHMETIC.

Introduction.—The value of Arithmetic in school instruction is twofold. A knowledge of the rules of Arithmetic, and a skill in applying them for the purpose of obtaining reliable numerical results, are acquisitions of great practical value to the youth of a commercial nation like our own. There is, however, over and beyond these absolute and direct values, an indirect and not less real value which the thorough study of Arithmetic affords as a means of mental training.

The two values of the study of Arithmetic may be conveniently viewed in the following contrasts, so far as means and ends are concerned :—

	Practical value.	Value for mental discipline.
Means	1. Tables taught by rote.	1. First truths in Arithmetic. 'Tables' and the 'values of place' carefully taught by abundant reference to concrete number.
	2. Rules learned by heart.	2. Rules explained and reasons given.
	3. Application of rules by mechanical imitation of some remembered typical example.	3. Power given to deal with any variations in the form of the example — problems in great variety.
Ends	4. Correct results in lower rules.	4. Correct results, somewhat delayed during the early stages on account of thorough teaching.
	5. Rapid progress in obtaining these results. Slow progress, and with uncertainty in higher rules.	5. Rapid progress through the higher rules.
	6. An exercise in memory and in concentration of effort, together with neat arrangement and mechanical precision.	6. An exercise in logical arrangement, in consecutive thought, and sound reasoning.

Whilst it is thus possible broadly to distinguish between the two values which the study of Arithmetic presents, it will be found in actual practice that the two cannot be entirely separated, for if our aim is mainly 'intellectual training,' the practice of rules must accompany the effort, and thus a facility in applying them must follow; on the other hand, should our aim be mechanical results, we cannot obtain these without a certain amount of intellectual effort and training.

Arithmetic as a Practical Art.—The practical value of Arithmetic consists in the ability it gives to deal accurately with figures for the following amongst other ends :—

1. Keeping Accounts.
2. Buying and Selling.
3. Making measurements of lengths and areas, and estimating weights.
4. Calculations for business and professional purposes such as :–
   (*a*) Estimating for contracts.
   (*b*) Registering amounts of work done.
   (*c*) Working out scientific problems and results.

In order to secure any or all of the above objects, a correct knowledge of the rules of Arithmetic is necessary, together with a skill in their accurate application, both being the result of abundant practice. There are also mental effects which follow this teaching of Arithmetic for practical purposes not to be despised. Amongst these the following may be readily recognized :

1. **Memory.**—This power is exercised in the retention of the rules, in the immediate recovery and ready application of the various tables, and also in the effort of keeping in mind the typical examples which embody and exemplify the rules.
2. **Concentration of Attention** is an attitude of mind cultivated by exercises in Arithmetic. This is especially developed by frequent practice in Mental Arithmetic.
3. An orderly and neat style of working tends to secure, over and beyond the habit of systematic arrangement, a gradual insight into the value of each stage in the working, and, in time (with the development of intellectual force), a knowledge of the **reasons** of the rule.

Arithmetic as a means of mental discipline.—The lesson in Arithmetic which starts with the statement of a rule, and which affords exercise in its application, but which does not designedly attempt to conduct the class to a knowledge of the reasons for each of the operations involved, does not secure the more important mental results which the teaching of Arithmetic is capable of effecting. If we wish to make the Arithmetic lesson a means of the highest intellectual advantage we must lay our plans carefully and systematically from the outset. Failure to make each operation in addition, in numeration, in notation, in subtraction, in multiplication, and in division perfectly clear, and, further, neglect to show how each of these is related to, and indeed grows out of, the preceding exercises, will assuredly reduce our teaching throughout the entire course to mechanical dulness. If, on the other hand, we are content

to move slowly over the early stages, and allow nothing to be done which is not thoroughly understood, then we may expect rapid progress throughout the higher rules, and, further, we may hope to see our pupils benefited intellectually by the exercises in correct thinking, and in sound reasoning, which our methods have provided, and our teaching has directed.

The following lessons have been prepared as examples of teaching having in view practical skill in obtaining correct results, but more especially prepared to secure intellectual training.

LESSONS IN SIMPLE SUBTRACTION,

Arranged with a view of showing the reason for each step in the working.

EXAMPLES AND RULES.

A. Introduction.

Examples to be worked mentally:

3 + 5 = 8	7 + 5 = 12
8 − 5 = 3	12 − 5 = 7
8 − 3 = 5	12 − 7 = 5

To show the connection between addition and subtraction and to teach the meaning of the terms '*minuend*' and '*subtrahend.*'

B. Examples in which each figure in the subtrahend is less than the figure of the same name in the minuend.

Contracted Method.			Working in full.		
H.	T.	U.	(1) 5	(2) 70	(3) 800
8	7	5	2	50	300
3	5	2	3	20	500
5	2	3			

Answers collected 3 (1), 20 (2), 500 (3) = 523

TEACHING HINTS, ILLUSTRATIONS, &c.

A.

Work examples in the concrete :—

1st. Adding together a number of objects.

2nd. Reversing the operation to give form to the simplest notions of subtraction.

Pass quickly to operations in abstract number using those which the children supply for exercises, both in mental addition and subtraction.

The terms are best learned by the teacher using them from the first.

B.

Scholars who have been exercised thoroughly well in numeration and notation will scarcely need reminding that the figure 5 taken from 7, represents the number 50 taken from 70, and similarly that the figure 3 from 8 represents the number 300 taken from 800.

It will be well to work a few examples both by the full and by the contracted methods.

If an entire lesson be occupied in this portion of the work, sound results will follow.

C. Examples in which the units figure in the subtrahend is larger than the units figure in the minuend.

C.

This is a very simple form of inductive reasoning and should be conducted in the following manner.

1. The rule of equal additions.

(*a*) *Simple Examples.*

$3 - 1 = 2$
Add 1 to each $4 - 2 = 2$
Add 5 to each $8 - 6 = 2$
Add 7 to each $10 - 8 = 2$
Add 10 to each $13 - 11 = 2$

(*b*) *What they show:—*

1. Equal amounts added to both numbers in each example.
2. The answer unaltered.

(*c*) *The rule they teach:—*

When the same number is added to both minuend and subtrahend the answer remains the same.

1. Use very simple examples. There is no value in setting difficult exercises at this stage. The mind needs to be concentrated mainly upon the processes by which the answers are obtained, and in finding out the similarities either in the examples and results, or in both.

2. Arrange the examples, fully worked out, neatly on the blackboard, so that the common features in the examples become apparent, as far as possible, to the eye.

3. Continue the exercises until the scholars can make similar examples after the teacher's model.

4. Stop as soon as the scholars, in reply to questions, can state the common conditions in the examples.

5. The proof of success is manifest when the pupils can state, in their own language, the rule, illustrated by the examples.

2. Application of the rule of equal additions.

Example 1.

H.	T.	U.		Changed to: H.	T.	U.	
3	5	7		3	5	$^{1}7$	10 has been added
1	2	8		1	$2+^{1}$	8	10 has been added
				2	2	9	

Example 2.

H.	T.	U.		Changed to: H.	T.	U.	
8	4	6		8	$^{1}4$	6	10×10 has been added = 100
3	9	0		$3+^{1}$	9	0	100 has been added
				4	5	6	

(*a*) It will not be necessary to work in detail many sums. The class will readily learn the rule, and at the same time understand it.

At times when a sum is being worked on the board and a scholar is adding *one* to either minuend or subtrahend, he should be asked to explain fully what he is doing and why he does it.

3. Statement of rule applied in working subtraction.
   (*a*) When any figure in the subtrahend is greater than the corresponding figure in the minuend, add to the minuend a figure of the value of the place next to the left.
   (*b*) Then subtract.
   (*c*) Complete the operation by adding to the subtrahend a number of equal value to that added to the minuend.

(3) This statement in its entirety must not be expected from children at this stage; they may, however, be guided to state each of the three portions into which it is divided.

SUMMARY OF TEACHING—

1. Subtraction is the reverse process to that of addition.
2. The 'minuend' is the larger number, and is placed in the top line of a subtraction sum.
3. The 'subtrahend' is the smaller number, and is placed below the 'minuend.'
4. When equal numbers are added to both minuend and subtrahend the answer remains unaltered.
5. Statement of the rule, *see above*.

Remarks upon the method of teaching subtraction.—In adopting the method shown in the lesson on subtraction the chief object has been to show the reason for each step taken. There would be some difficulty experienced in getting young children to follow and to understand fully the entire process, and there would, furthermore, be postponement of ability on the part of the children to obtain correct answers. The advantage, however, of pursuing this method rests in the intellectual training which the exercise yields. Instead of using the old fashioned but misleading formula of 'borrowing *ten* and paying back *one*,' the learner from the very beginning uses a process he understands, and which, if called upon, he can explain.

> Speaking upon the old method of 'borrowing and paying back,' Dr. Fitch, in his 'Lectures to Teachers,' says, 'As an exercise in intelligence the method is utterly worthless. The word "borrow" has been put into the children's mouths, but whence the ten is borrowed, why it is borrowed, or what sort of morality that is which permits you to "borrow ten" in one direction, and pretend to compensate by "paying back one" in another, are points which are left in obscurity. Language like this, which simulates explanation and is yet utterly unintelligible, is an insult to the understanding of a child; it would be far better to tell him at once that the process is a mystery, than to employ words which profess to account for it, and which explain nothing.'

Effect of teaching upon intellectual habits.—When the learner is thus taught to know the reason of each stage in the working of a simple sum there is gradually developed a

desire to apply no rule without knowing why it is used, and finally a habit of enquiry is formed, and a desire for complete knowledge is acquired, of service, not only in exercises of Arithmetic, but throughout the entire range of intellectual activity. On the other hand, the continued working by rules which are not understood leads to a habit of resting content with imperfect knowledge. This is the more to be regretted, because in the majority of school subjects there is more or less uncertainty, either in the facts they comprise or in the truths they teach; whereas in Arithmetic we may have full and complete knowledge; for its data—concrete notions of number and space, are self-evident; and its higher truths—rules and principles of Arithmetic—are obtained by the strictest processes of reasoning upon these accepted data.

LESSONS ON THE RULE OF SIMPLE PROPORTION.

Part I.—Ratio and Proportion.

EXAMPLES AND TRUTHS THEY TEACH.

A. The term 'Ratio'—what it means.

Comparison of Nos.	Result.
2 and 4	2 is contained twice in 4
3 ,, 9	3 ,, three times in 9
4 ,, 16	4 ,, four ,, 16

The comparison of two numbers, made by finding how many times one is contained in the other, forms a 'ratio.'

B. How ratios are expressed and measured.

	This is expressed by the fractions
(*a*) 2 is half of 4	$\frac{2}{4}$
(*b*) 3 is one-third of 9	$\frac{3}{9}$
(*c*) 4 is one-fourth of 16	$\frac{4}{16}$

Mode of stating a ratio.	The fraction expressing the measure of each ratio.
(*a*) 2 : 4	(*a*) $\frac{2}{4}$ or $\frac{1}{2}$
(*b*) 3 : 9	(*b*) $\frac{3}{9}$ or $\frac{1}{3}$
(*c*) 4 : 16	(*c*) $\frac{4}{16}$ or $\frac{1}{4}$

ILLUSTRATIONS AND TEACHING HINTS.

A.

Choose a sufficient number of examples to fix the notion that the comparison is to be made by determining how many times one number is contained in the other.

Expect some scholars to make the error of comparing numbers by subtracting the less from the greater. If this occur, more examples must be supplied similar to those in the left hand side column, and similar results must be obtained.

B.

This stage supposes a knowledge of elementary fractions.

The two modes of expressing the same thing should be continued until the association between the ratio and the fraction measuring it is complete.

This result can only be secured by introducing a large number of examples, some of which the scholars should themselves suggest, and express first in the ratio form, then change each ratio to the fraction which measures it.

C. Comparison of ratios.

(*a*) The value of the ratio 2 : 4 is expressed by the fraction ... $\frac{1}{2}$
,, 3 : 6 ,, $\frac{1}{2}$
(*b*) ,, 3 : 9 ,, $\frac{1}{3}$
,, 4 : 12 ,, $\frac{1}{3}$

Hence the ratio 2 : 4 = the ratio 3 : 6, and the ratio 3 : 9 = the ratio 4 : 12.

(*c*) The equality between the above ratios is stated as follows:—

(1) In full—
As 2 is to 4 so is 3 to 6.

(2) Contracted to—
As 2 : 4 :: 3 : 6.

D. Term and its definition.

The term 'proportion' is applied to two equal ratios arranged for comparison.

C.

If the preceding stage has been thoroughly mastered, there will be but little difficulty in establishing an identity between each of the two pairs of ratios.

Very many more examples, however, should be arranged in similar form on the black-board, and these should be supplied and arranged by the scholars.

The statement of the proportion must be shown on the board both in the *full* and the *contracted* form, and the term *proportion* must be told.

D.

Waste no time in the attempt to train out the above, but allow the class to state, in their own language, what they mean by the term 'proportion,' and then mould their answers into a definition of the term.

ABSTRACT OF THE LESSON—

1. A ratio is the comparison of two numbers in order to find how many times one is contained in the other.
2. A ratio is stated in the following way:—as 2 : 4.
3. Its value is expressed by the following fraction, viz. :—$\frac{2}{4}$.
4. Ratios which can be expressed by the same fraction are **equal to one another.**
5. When two equal ratios are arranged for comparison they form a **'proportion.'**

Part II.—'Rule of Three' by Proportion.

EXAMPLES AND TRUTHS TAUGHT.

A. Introduction.

Revise the previous lesson and thus bring the following matter afresh to the minds of the class.

1. What a ratio is.
2. How it is stated.
3. How its value is expressed.
4. When two or more ratios are equal.
5. The name given to two equal ratios

ILLUSTRATIONS AND TEACHING HINTS.

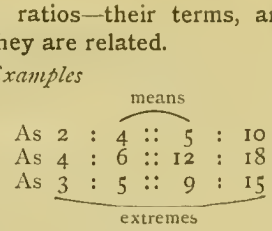
A.

Examples in illustration of each statement made by the scholars in answer to the questions of revision should be required. The thorough revision of the previous lesson secures three ends:—

1. The knowledge gained in past teaching is rendered more permanent by repetition.
2. A basis is afforded for teaching new matter.
3. The connection between knowledge in possession and that to be acquired is established.

B. Equal ratios—their terms, and how they are related.

(*a*) *Examples*



(*b*) *New relations.*

Means.		Extremes.
4×5	=	2×10
6×12	=	4×18
5×9	=	3×15

(*c*) *Statement of truth established.*–

The product of the 'means' is equal to the product of the 'extremes.'

C. Inferences from the truth just established.

(*a*) *Examples.*

(1) $\frac{4 \times 5}{2} = 10$, the 4th term

(2) $\frac{6 \times 12}{4} = 18$, the 4th term

(3) $\frac{9 \times 5}{15} = 3$, the 1st term

(*b*) *General rule from above examples.*

If the product of the 'means' be divided by one 'extreme,' the quotient will be the other 'extreme.'

(*c*) *The 'Rule of Three' by Proportion deduced from rule* (*b*).

Multiply the second and third terms together and divide the product by the first term: the quotient will be the fourth term.

B.

(*a*) After several equal ratios have been written out in the form of 'proportion,' the names '*means*' and '*extremes*' may be affixed and the suitability of the terms suggested.

(*b*) If the scholars, by exercising their ingenuity, can bring out the relationship existing between the new grouping of the terms, they ought to be permitted to do so. Whilst every attempt manifesting thought is encouraged, check all thoughtless guessing.

The statement of the truth should be left to the class, for unless they can formulate it we have no certain evidence that it is fully known. If the answers at this stage show that the truth is imperfectly grasped, then more examples must be supplied and the teaching continued.

C.

(*a*) It may be necessary to multiply examples before the rules become evident to all the class.

Make these examples as simple as possible. The formation of the general truth is the main object of thought. This cannot be accomplished if much attention is concentrated upon working examples with large numbers.

(*b*) and (*c*). These truths must *not* be told; the exact wording of the truths is of very little account, but the knowledge embodied in the statements must be acquired by the children from a consideration of the particular examples upon which the truth is based in the first case (*b*), and a power to recognise the 'Rule of Three' by Proportion as a truth deduced from (*b*) in the second case.

The exercises of reasoning which this plan of teaching encourages are of more value than the mere knowledge of the rules.

BLACK BOARD NOTES—

1. In proportion the middle terms are the 'means,' the end terms are the 'extremes.'
2. The product of the 'means' is equal to that of the 'extremes.'
3. From this truth the following rules are inferred :—
   (*a*) *General Rule.*—If the product of the 'means' be divided by one 'extreme,' the quotient will be the other 'extreme.'
   (*b*) *The 'Rule of Three' by Proportion.*—The fourth term is equal to the product of the second and third terms divided by the first term.

ELEMENTARY NOTIONS OF A FRACTION.

EXAMPLES, AND TRUTHS THEY TEACH.

A. To teach the difference between objects in their *entire* and in their *fragmentary* forms.

(*a*) An entire apple may be contrasted with irregular divisions, such as those used in pastry.

(*b*) Two sticks are shown, the same in size. Afterwards, one is broken into three portions of unequal size.

(*c*) The portions of the apple, and those of the broken stick are alike :—

i. In being parts of entire objects.

ii. In being unequal divisions of these objects.

(*d*) **Term and its meaning.**—The unequal divisions into which any whole object may be broken are termed '**fragments.**'

ILLUSTRATIONS AND TEACHING HINTS.

A.

(*a*)

Fig. 1. Representing an apple in its entire state.

Make the contrast between the entire apple, and one broken into irregular portions, plain and striking, by allowing a scholar to divide the second apple into any number of pieces of different sizes.

(*b*)

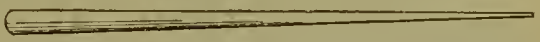


Fig. 2. A stick in its entire state.

Fig. 3. A similar stick broken into fragments.

(*c*) The multiplication of examples is useful, inasmuch as the objects maintain the interest and attention of the class whilst the truth illustrated is being repeated; and, further, the recognition of the same fragmentary condition amidst varying substances tends to fix more permanently the common notion.

(*d*) The term must be supplied by the teacher. Its meaning should be stated by the children.

B. To teach the difference between objects in an entire condition, and those divided into parts termed 'fractions.'

Fig. 4. Four equal divisions of an apple.

(*a*) Contrast these with the irregular division stated above.

(*a*) Divide an apple into four equal divisions. Each division thus formed is one-fourth of the whole.

Fig. 5. A yard measure divided into three equal parts.

(*b*) Take a yard measure and divide it into three equal parts. Each of these is termed a third of the whole.

(*b*) Contrast these equal parts with the three unequal pieces of the broken stick fig. 3, and suggest other examples of equal divisions, such as:—

(1) Journey to school 3 equal miles.

(2) An acre field divided into 4 equal roods.

(3) A quart of milk into 2 pints.

(4) Scholars to supply similar examples of objects divided into equal or fractional parts.

(*c*) **Test Example.**— Distribute strips of paper and require one strip to be torn into fragments, and another into 2, or 4, or 8 equal or fractional parts.

(*d*) **Term and its meaning.**— The equal divisions into which any entire object may be divided are termed '**fractions.**'

(*d*) Supply the term, and ask for its meaning.

C. Mode of representing fractions.

Examples—

C.

(*a*) These fractional forms must be told in the first instance. When two or more examples have been set before the class, together with illustrations of the fractional parts they represent, then the identity between the change of the lower number with the change in the number of parts into which the whole object is divided may be made.

(*a*) $\frac{1}{4}$ represents one of the four equal parts in fig. 4.
$\frac{1}{3}$ represents one of the three equal parts in fig. 5.

(*b*) The lower number changes with the number of parts into which the whole is divided, and it represents that number. **It is called the 'denominator.'**

(*b*) The establishment of this identity is essentially the work of the scholars, and examples must be repeated until the identity is recognised. Then the name may be supplied by the teacher.

(*c*) $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$. These fractions represents one, two, three, and four of the equal divisions, respectively, into which the apple in fig. 4 has been divided.

(*d*) The change, here, is in the upper figure of the fraction, and this figure changes with the change in the number of equal parts the fraction is intended to indicate. The upper figure, in each case, represents that number. It is called the 'numerator.'

D. Definition.

The same method is advised for teaching the 'position and use of the numerator' as that recommended above for teaching the 'position and use of the denominator.'

When the terms 'numerator and 'denominator' can be correctly applied they should be defined, and their functions clearly stated.

D. The definition is the work of the pupil, and the teaching in this lesson should be sufficient to enable the learner to do this readily.

ABSTRACT OF TRUTHS TAUGHT—

1. A fragment is one of the unequal pieces into which any thing may be broken.
2. A fraction is one or more of the equal parts into which any number may be divided.
3. The denominator of a fraction indicates the number of equal parts a number is divided into.
   It is the lower figure of a fraction.
4. The numerator is the upper figure of a fraction, and represents the number of equal parts which the fraction indicates.

How far is it wise to teach young scholars the reasons for the processes they employ in Arithmetic?

In reply to this question, experience has taught that children who have been well grounded in numeration and notation, and in the decomposition of the higher numbers into those of a lower name, have very little difficulty in understanding the following operations:—

i. The process of carrying in addition and multiplication.

ii. The application of the rule of equal additions in subtraction.

iii. The 'place arrangement' of each line in an extended multiplication sum.

In short division we are met with a considerable difficulty, and the attempt to show a class of beginners the reason for each step might require more effort than we can spend, and make demands upon our scholars which their immature intelligence could not meet.

Work, for instance, the example 1285 ÷ 5 with a child who has been thoroughly well grounded in place value. The first figure is 1000. This, we say, cannot be divided by 5; afterwards, we show that it can be so divided, for we say, 5 into 12, *i.e.*, into 1200 = 2 times, *i.e.*, 200 times, but 200 times 5 is 1000, so that, in reality we have divided the 1000 by 5, although we started by saying we could not do this. The operation, when fully explained, is found to consist of the following stages:—

1. Splitting up the number 1285 into three numbers, each of which is divisable by 5 without remainder.

2. The division of 1000, 250, and 35, successively by 5.
3. The addition of the three results, viz., 200 + 50 + 7 to form the complete answer.

In this case, when the difficulties of complete explanation are very manifest, it is best to make a compromise, *e.g.*—

(*a*) Begin by dividing the thousands figure in the example above by 5, but state that as the answer in this case is wanted in thousands there can be none, as one is less than five.

(*b*) Now, decompose the whole number into 12 hundred and 85, and divide 12 hundreds by 5, taking care to require the answer this time in hundreds.

If 12 hundreds be written in figures (1200), and nothing is said about the answer being in hundreds, then a thoughtful child might reply 250.

(*c*) The remainder 2 belongs to the hundreds, and the number now left to be divided is 28 tens and 5. The answer is required in tens, and hence is 5 with 3 tens over.

(*a*) The division of the 3 tens + 5, *i.e.*, 35 by 5 completes the sum.

The Question answered.—When, by working many examples, facility and certainty in the use of the rule have been attained, then, before the rule is finally left for the succeeding one, it will be well to take separate lessons on such topics as the following:—

1. What are the numbers actually divided by six in the sum 6)948 ?
2. A simple division worked so as to show the full value of each figure used.
3. In division, why do we begin with the figure of highest value in the dividend in place of the figure of lowest value as in the case of the previous rules ?

The short answer to the question with which we started on page 157 is this—Use no method, rule, nor process in Arithmetic without making it understood, except in cases where the rule is either so contracted or complex that the reasons for its use are beyond the capacity of the learner. In that case, use the rule until it is familiar and until it can be applied with certainty; then, and before finally leaving it, explain as far as the intelligence of the pupils will allow.

The place which simple memory, or what is sometimes termed 'mechanical working,' holds in teaching Arithmetic.

When a higher and a lower effect is obtainable in our teaching of any subject we are in danger of aiming almost exclusively at either one or other of them. Hence it follows that some books upon Arithmetic simply state the rules, work an example in illustration of each, and finally present a number of exercises for practice in applying them. Such books aim mainly at the lower effect. Now whilst it has been the chief aim throughout these pages to make very prominent the higher intellectual operations which exercises in the reasons of rules are capable of developing and training, the importance and value of a complete and thorough acquisition by the aid of memory of the tables and rules of arithmetic must be admitted.

> 'It is plain,' says Professor Bain, 'that the multiplication table is a grand effort of the special memory for symbols and their combinations, and the labour is not to be extenuated in any way. The associations must be formed so as to operate automatically, that is, without thinking, enquiring, or reasoning; and for this we must trust to the unaided adhesiveness due to associations of sound arising from mechanical iteration.' The same general truth is manifest in nearly all our exercises in arithmetic. Very much of the effort in any sum we work is automatic, and entirely without thought, enquiry, or reason; *e.g.*, the tables and the application of past rules form, in the main, exercises of memory, and the more completely automatic or mechanical the exercise the greater the thought available for the new applications which the sum demands.

The most favourable condition of successful teaching in Arithmetic appears to be this. When an extension of our knowledge of number is in contemplation, such as the teaching of a new rule, make its connection with past teaching quite clear, show how the new rule arises out of, and is dependent upon, truths already in possession; then, when the new truth or rule is established, strive by continued practice to make its future reproduction and application as automatic as possible.

> An example of this condition of successful effort is manifest in the way in which a scholar who has learned the tables of multiplication and addition in early childhood, applies this knowledge automatically, and with the utmost certainty, in the higher exercises of his later school days. In contrast with this condition of successful effort see the laboured effort of the youth who in attempting to work the higher rules of Arithmetic is constantly stopping to supplement and correct his imperfect knowledge of the tables and early rules.

Opinion of Educationists—(Dr. Bain).

We conclude this review of the most suitable conditions for making the study of Arithmetic of greatest service, from a practical and from an educational point of view, by quoting the following from Professor Bain's work on the 'Science of Education.' He says, in a brief review of the best methods to be followed in teaching the most important rules of Arithmetic:—

'While this complete association (the result of immense iteration of the multiplication table) is the ground work of the process of multiplication, there are various points in the actual exercises where the intelligent conception of numbers comes in aid, as in the placing of the multiplier below the multiplicand, and the arrangement of the lines of the successive products. For these matters a knowledge of the reasons is very serviceable. The same applies to fractions, in them the reasons assist the mind in observing the rules, which are not so easily held in the unmeaning shape as are the addition and multiplication tables. Still more does the knowledge of reasons apply to the "rule of three," which can hardly be applied under any mode of stating it that does not assign the explanation . . . . It is thus apparent, that, while many of the links of arithmetical operations are blind unmeaning symbolical associations, which are possible at a certain age . . . . yet there runs through the subject a necessity of perceiving the grounds and connections of the various operations; and unless this perception is arrived at, there will be incessant halting. Nevertheless, when the proper routine is once learnt for all the recurring cases, the only thing wanted is facility in the cardinal operations, the result of the symbolical memory.'

Summary of intellectual operations exercised and trained by a thorough course of instruction in Arithmetic.

1. **Processes of reasoning.**
   - (*a*) *Inductive.*—As when rules and general truths are established by the consideration of a group of particular examples. This form of reasoning is illustrated in the establishment of the rule of 'equal additions' by a consideration of the examples given in the lesson in simple subtraction.
   - (*b*) *Deductive.*—By far the more common form of reasoning in Arithmetic and exemplified whenever a general rule is applied to the solution of a particular example.
2. The various operations in thinking which these processes of reasoning include, *e.g.*,
   - (*a*) **Classification** as in the grouping of examples for the purpose of establishing rules.
   - (*b*) **Abstraction**, in the consideration of number apart from all objects.
   - (*c*) **Judgment**, in identifying the resembling qualities in groups of numbers, in selecting the rule by which a solution is to be obtained, and in estimating the probable truthfulness or otherwise of the results obtained.

3. **Concentrated Attention.**—This is an attitude of mind necessary to all intellectual effort, no school work, however, demands and exercises this power more than Arithmetic.

4. The **Memory** is very active in supplying the necessary material for rapid and correct working in the form of tables and established rules.

5. **Perception.**—There is very little work for the perceiving or observing powers. In the early stages objects are presented in the concrete ; space knowledge in the form of observed dimensions is obtained by the use of rule and chain, and in time by continual association of actual results obtained by careful measurement with apparent size and clearness of outline, the distances and sizes of objects are roughly observed.

6. Little as is the work of the observing powers in Arithmetic there is still less exercise of the Imagination.

MENTAL ARITHMETIC.

Introduction.—The mental arithmetic of most value for educational and practical purposes is that which gives practice in examples of the ordinary rules. It differs from the usual arithmetic in that the examples are short and simple, dealing only with numbers which may be readily carried in the memory, and containing no more stages in working than can be fairly grasped by the scholar without assistance from a book or a slate.

When valuable.

1. *In the early exercises of arithmetic* examples of processes in addition, subtraction, multiplication, and division, are necessarily simple and may be taught through examples worked mentally more readily than through examples with larger numbers. In these simple mental examples the mind is comparatively free from the effort of dealing with long and involved calculations, and is, hence, at liberty to concentrate itself mainly upon the *method* of working.

2. *When commencing a new rule,* in either the simple or more advanced stages of arithmetic, much preparatory work of a most useful kind may be done mentally. These preliminary mental exercises may be made to indicate the method of working which must be followed when the more difficult and involved examples come to be worked on paper.

3. *In explanation of a difficult stage in any rule.* In working examples on paper, the scholar frequently hesitates at a certain point in the working where special difficulty manifests itself. A few carefully-selected exercises of a simple kind, illustrative of the working at this stage, done mentally, will greatly assist the learner in clearing up the difficulty.

Examples of suitable exercises in the Mental Arithmetic of the Simple Rules.

1. Exercises in decomposing numbers:—

(*a*) 25 = 2 tens and 5 units.
36 = 3 tens and 6 units.
105 = 10 tens and 5 units.
246 = 24 tens and 6 units.

(*b*) 576 = 5 hundreds, 7 tens and 6 units, *or*
= 57 tens and 6 units, *or*
= 5 hundreds and 76 units.

(*c*) 1487 = 14 hundreds, 8 tens and 7 units, *or*
14 hundreds and 87 units, *or*
148 tens and 7 units, *or*
1 thousand and 487 units, *or*
1 thousand, 48 tens and 7 units,
&c., &c.

2. Exercises in addition.

(*a*) *Counting by* twos, threes, *&c.*

2, 4, 6, 8, 10, 12, 14, 16.
1, 3, 5, 7, 9, 11, 13, 15.
3, 6, 9, 12, 15, 18, 21, 24.
1, 4, 7, 10, 13, 16, 19, 22.

(*b*) *Add* four *to each figure below.*

3, 5, 7, 6, 9, 2, 0, 4, 8.
13, 15, 17, 16, 19, 12, 10, 14, 18.

(*c*) *Add any other units figure* to similar rows of numbers, and note numbers where any hesitation manifests itself, and supply most practice in these, *e.g.*, 17 + 4, 23 + 8, &c.

3. Exercises in subtraction.

(*a*) Count by twos, threes, &c. (addition), then reverse the process, beginning with the highest figure reached, and allow each scholar in turn to subtract two, three, &c.

(*b*) Place rows of figures before the class, as in addition (*b*), and from each subtract 2, 5, 7, &c.

(*c*) Exercises in splitting up figures, *e.g.*, 12 into 5 and 7, 3 and 9, 2 and 10, &c.

4. Exercises in multiplication.

(*a*) *Connection between addition and multiplication.*

4 + 4 = 8, also 4 × 2 = 8.
7 + 7 + 7 = 21,
also 7 × 3 = 21.
9 + 9 + 9 + 9 = 36,
also 9 × 4 = 36.

(*b*) *Multiply each figure below in turn by an units figure.*

5, 12, 0, 7, 2, 9, 1, 4, 3, 8.

(*c*) *Multiply by* 10, 100, 20, 200, &c.

(*d*) *Multiply as above, and add units figure to the result, e.g.*, multiply by 5 and add 7.
1, 8, 5, 7, 0, 6, 2, 4.

This exercise may be varied to almost any extent. It will be found of great service in giving facility in future exercises of multiplying and adding.

(*e*) *Multiply as above and subtract a number from the result.*

5. Exercises in division.

(*a*) *Connection with multiplication.*

$5 \times 7 = 35$, also $35 \div 7 = 5$
$6 \times 9 = 54$, also $54 \div 9 = 6$
$8 \times 12 = 96$, also $96 \div 12 = 8$

(*b*) *Connection with subtraction.*

$36 - 9 = 27$
$27 - 9 = 18$
$18 - 9 = 9$
$9 - 9 = 0$
} = 4 times.
also $36 \div 9 = 4$ times.

(*c*) *Division of numbers without remainders, e.g.,*

15, 3, 12, 27, 18, $36 \div 3$.

(*d*) *Division with remainders.*

17, 19, 23, 29, 37, $59 \div 9$.

(*e*) $\frac{1}{4}$ of 8, 32, 48, 4, 12, &c.
$\frac{1}{3}$ of 15, 27, 18, 3, 36, &c.
$\frac{3}{4}$ of each number in the first line.
$\frac{2}{3}$ of each number in the second line.

Value of the above exercise in Mental Arithmetic.

1. Affords abundant practice in the processes of arithmetic.
2. Assists in enabling the learner to acquire a knowledge of principles and rules.
3. Yields facility in dealing with ordinary combinations of numbers, especially with the *tables* and *simple rules*.
4. Quickness at arriving at results is cultivated.
5. Effort is aroused and concentration of mind is exercised and developed.
6. They form a preparation for the arithmetic of after life, much of which is necessarily mental.

Special rules for working either long or difficult examples mentally.

The following examples are similar to those set annually in the Government examinations for teachers' certificates. They are all to be worked mentally, and twenty minutes are allowed for the exercise. As an intellectual effort the exercise demands—

1. The acquisition and the ready application of a considerable number of principles and rules.
2. The power to retain results over several stages of working.
3. With the time limit, a highly concentrated effort of attention.

1. $650 \times 101 - 651 \times 99 = 650\,(101 - 99) - 99$
$= 1300 - 99 = \underline{1201}$ Ans.

2. 6240 things at 19s. 4d. each = £6240 − $\frac{1}{30}$ of £6240
= £6240 − £208 = <u>£6032</u> Ans.

3. The interest of £128 at $3\frac{1}{8}$ % per annum, S.I., for 3 years
= £$(128 \times 3) \div 32$
= <u>£12</u> Ans.

4. 10 °/₀ was lost by selling a horse for £65 5s.; required cost price
$= £65\ 5s. + \frac{1}{9}$ of £65 5s.
$= £72\ 10s.$ Ans.

5. Income derived from investing £899 in 4 °/₀ at 116 (no brokerage)
$= £\frac{899 \times 4}{116}$
$= £31$ Ans.

6. $(20^3 - 19^3) = (20 - 19)(20^2 + 20 \times 19 + 19^2) = 1141$ Ans.

7. Mean proportional to 292 and 657.
Solution. Mean proportion $= \sqrt{292 \times 657}$
$= \sqrt{(73 \times 4)(73 \times 9)}$
$= 73 \times 2 \times 3$
$= 438$ Ans.

8. The sum of two numbers is 321, their difference is 125; find them.
$(321 + 125) = 446.$
$\therefore$ one number $= \frac{446}{2} = 223.$
$\therefore$ other $= (321 - 223)$
$= 98$ Ans.

9. $\frac{3}{7}$ of $\frac{21}{22}$ of $5\frac{1}{2}$ pence reduced to the fraction of 1s. $1\frac{1}{3}$d.
$\frac{3}{7} \times \frac{21}{22} = \frac{9}{22}.$
$(\frac{9}{22} \times \frac{11}{2})$d. $= \frac{9}{4}$d.
Fraction required $= \frac{\frac{9}{4}}{\frac{40}{3}} = \frac{27}{160}$ Ans.

10. £30 18s. is divided between 16 men and some women; each man has £1 2s. 6d., each woman £1 1s. 6d.; find number of women.
£30 18s. $-$ (£1 2s. 6d. $\times$ 16) $=$ £12 18s.
$\therefore$ number of women $= \frac{£12\ 18s.\ 0d.}{£1\ 1s.\ 6d.} = 12$ Ans.

11. From a vessel three-sevenths full 22 gallons are drawn, and it is then one sixth full; how much does the vessel hold?
$\frac{3}{7} - \frac{1}{6} = \frac{11}{42} = 22$ gallons,
$\therefore \frac{1}{42} = 2$ gallons,
$\therefore$ the cask contained 84 gallons.

12. Divide £888 between A and B so that $\frac{1}{6}$ of A's share $= \frac{5}{18}$ of B's.
$\frac{1}{6}$ of A's $= \frac{5}{18}$ of B's, $\therefore$ A's $= \frac{30}{18}$ B's,
$\therefore$ shares were as 30 : 18 (30 + 18 = 48),
$\therefore$ A's $= £(\frac{30}{48} \times \frac{888}{1}) = £555,$
$\therefore$ B's $= £333.$

13. 40 children pay 3d. each, 54 pay 2d. each, the remaining 26 pay altogether 16s. per week; find the average weekly payment.
Amount received $= (40 \times 3)$d. $+ (54 \times 2)$d. $+ 192 = 420$d.
No. of children $= 120$; $\therefore$ Average $= \frac{420}{120}$d. $= 3\frac{1}{2}$d. Ans.

14. Present worth of £805 due 5 years hence at 3 °/₀ per annum.
£100 is present worth of £115,
Present worth required $= £(805 \times \frac{20}{23}) = £700$ Ans.

LESSONS IN GEOGRAPHY.

Introduction.—In every Geography lesson the aim of the teacher is two-fold. (1) Information of a useful and interesting nature is supplied concerning the world in which we live. (2) The process of acquisition is so arranged as to yield exercises in observation, memory, imagination, and to a limited extent in processes of reasoning. The following statement sets out in greater detail the chief objects aimed at in a systematic course of lessons in Geography :—

Educational Effects.	Practical Value.
(*a*) To direct the learner to a careful *observation* of the most important surface appearances to which he has direct access.	(*a*) To give an amount of information respecting the most important countries of the world, and their inhabitants, sufficient to enable the pupil intelligently to follow events as they are reported from day to day.
(*b*) To arouse and exercise his *imagination* by the effort to realise the aspects of the surface, and the condition of the inhabitants of countries beyond the learner's immediate neighbourhood.	(*b*) To supply the knowledge which the pupil will require in after life for purposes of trade and of commercial intercourse, either with different parts of his own land or with other countries.
(*c*) By a careful arrangement of the facts of Geography to secure their easy retention (*memory*).	(*c*) To impart the knowledge necessary to give an intelligent notion of the importance of other nations respectively, as well as to enable him to realise the extent, the wealth, and the power of his own.
(*d*) To exercise the *reasoning* powers of the learner, by the establishment of the general truths of Physical Geography.	

Methods of teaching Geography contrasted.—The facts of geography as they are classified in most text-books under the headings of position, boundaries, extent, coast-line, surface, drainage, &c., may be quickly learned by an apt pupil, and by frequent repetition may be acquired by the dullest; at the same time it is evident that the effort affords intellectual exercise almost entirely limited to that of memory. Upon a closer investigation of the relationships existing between the facts enumerated above, it will be found that a complete re-arrangement of them enables us to make much more natural groupings, and at the same time to call into active operation other and higher intellectual powers than that of memory.

1. **Examples of Teaching.**—The youth who teaches the rivers of England as they are generally grouped, arranges those flowing into the North Sea in one class, those flowing into the English Channel into another class, and so on. He points to the Tyne, Wear, Tees, Yorkshire Ouse, Trent, &c., as they occur in order on the map; these are repeated until the sequence of the names, and the relative positions of the rivers become familiar. So far the intellectual effort is a very simple form of memory. Now, to teach a pupil to associate the Trent with the Yorkshire Ouse is fatal to an intelligent appreciation of the geographical truths which should be connected with either of these rivers. The mountains on the west; the gradual slope south-eastwards to the sea; the corrugation of this slope into dale and moorland—each dale having its own watercourse; the joining of these minor streams into one principal river and the course of this river over the spreading vale of York, and finally the wide estuary of the Humber and its connection with the sea; these are the facts of general geography which naturally group themselves round the river Ouse. The attempt of the learner to realise this grouping of related geographical facts exercises not only the memory, it also calls forth an effort of the imagination, and in the end it establishes a connection between certain effects and the operations in nature causing them.

2. *The east and south-east coast-line of England.*—A simple lesson on the coast-line of England is sometimes heard in which the features are grouped under the headings of Capes and Bays. These are repeated until their names and the order of their occurrence are well known. Here, again, the scholars exercise memory almost exclusively. If, however, we wish to raise the effort in its educational aspects we may proceed as follows:—Take a general view of the ranges of hills in the south and east of England. Starting from Salisbury Plain, the North Downs are first followed to their terminations in the North Foreland and the South Foreland; similarly the South Downs to Beachy Head. Then the range running to the north-east through Berkshire, Cambridgeshire and Norfolk to Hunstanton is traced; and finally, the more northern range through Lincolnshire and Yorkshire to its termination in Flamborough Head. In each case the ridge running across the country is found to terminate in a bold promontory, and thus the connection between mountain ridge and bold headland is readily made. Our lesson will be improved if, by means of a model of the district, we indicate the direction of the valleys between these hill ranges and of the rivers draining them; for these followed to the coast mark out the openings, such as the Wash, the various estuaries on the Suffolk coast, and the mouths of the Thames and the Stour.

   In the lesson thus sketched many geographical facts besides the coast features are taught, it is true; at the same time the headlands and bays have been much more thoroughly acquired than they could have been if they were simply repeated until their names became familiar.

3. *The south-west of England and Wales.*—In the last example the effects of water running over the surface, and of the sea waves dashing against the coast, were seen to be a succession of hill ranges with intervening valleys on the land, and a series of bold headlands and wide openings on the coast. Let the attention of the class be now turned to

a district remarkable for the variety of its rock constituents, so that the effect of running water upon the surface, and sea wave along the coast be again observed. In the south-west of England and in Wales rocks of a very hard nature, like granite, resist the weathering action of frost and running water much more successfully than the softer limestones and sandstones surrounding them. Many of the Tors of Cornwall and Devonshire have been thus formed; similarly, when we approach the coast, the rock masses of hardest texture wear away much more slowly than the softer rocks on either side. The formation of St. Bride's Bay between two bold promontories, and of Mount's Bay between the denser rocks of the Lizard and Land's End, is thus explained, as well as the vast sweep of Cardigan Bay, with its rocks of almost uniform texture, between the harder masses forming Braichy Pwl and Dinas Head.

With the multiplication of examples like the above, the learner is led to recognise the connection between a mountainous mainland and a rugged indented coast line; he also discovers that both are due to the same cause, viz., that when a district has been disturbed, so that it presents the upturned edges of rock masses varying in hardness, the results must be—(1) Mountain ridge, with intervening valleys and gorges on the mainland; (2) bold crag and cliff, with deep inlets or bays separating them on the coast.

When these truths have been established by the careful examination of numerous examples, much of the Physical Geography of Western Britain, of Western Ireland, and of Scandinavia, becomes simple and clear; the facts are readily remembered, and the truths of Physical Geography which they illustrate become applicable in almost every future lesson. To this mode of teaching it may be objected that it requires a knowledge of Physical Geography not readily accessible, and that ordinary maps and atlases do not supply the requisite illustrations. These difficulties, however, are readily removed, for a fair acquaintance with Physiography will supply the desired knowledge, and the best maps for teaching purposes are not those which can be bought, but those which the teacher sketches during the progress of his lesson.

Intellectual results aimed at in teaching Geography.

1. **Observation.**—Introductory to lessons in Geography by means of maps, atlases, and reading books, there should be a series of object lessons dealing with the simple facts of geography as these are illustrated by the child's immediate surroundings. The school, the play-ground, the street, country lane, field, stream, and hill, form topics for these first lessons.

The chief aim of teaching at this stage must be to put the child into the way of acquiring knowledge by its own observation. We must not do this for the child. The notions it gains by carefully directed observation, form the material out of which it must afterwards elaborate its knowledge of areas beyond the range of its senses, and no pains should be spared to make this knowledge correct and complete. As each item of geographical knowledge is acquired, it should find expression in plan and map as well as in words.

2. **Memory.**—When facts are repeated simply in the order of their position, as in the enumeration of lists of rivers, capes, bays, &c., the exercise of memory is of the lowest order, but when such associations as the following are made, viz.:—(*a*) river with its valley; (*b*) hill ranges with cliffs and headlands; (*c*) productions with industries, &c., the associations arouse interest because they are natural, and because they are natural they not only indicate effects but frequently suggest the causes with which these effects are allied. Here then we recognise the two most important conditions of a sound memory exercise, viz., *interest* and *association*.

Some lessons in geography appeal almost entirely to the memory, *e.g.*, the enumeration of the counties of England, the names of the chief English railways, the population of the different countries of Europe, the latitude of Madrid. In all such lessons as these, the true teaching method will be that based upon the principles by which memory is best exercised. There must be :—

1. *An aroused interest.*—The facts of a geography lesson may lack all novelty, but interest may be stimulated by the mode in which they are presented. A railway map, *e.g.*, gains in interest when each line of railway is drawn in coloured chalks.
2. *Repetition.*—Not that of words merely, but of the fact by means of sketch map, wall map, and the reproduction exercise set for home-work.
3. *Associations.*—These should form a marked feature in every geography lesson in which many facts, names, &c., have to be learned. These associations may be (*a*) that of *contiguity*, as in the example 'Newcastle-on-Tyne,' (*b*) that of *contrast*, as when the east coast of England is contrasted with the west, or (*c*) that of *similarity*, as when the climate of Sitka is compared with that of Edinburgh.

3. **Imagination.**—The simple repetition of names, whether from a book, a map, or an atlas, arouses no effort of the imagination. The introduction of a model, and the effort of the teacher to place before the minds of his pupils by graphic statement the facts of geography as they occur

together in nature, never fail to stimulate the imagination of the learner. He strives to realise the natural grouping of related geographical facts and in the effort his imagination finds most agreeable and fruitful exercise.

The geography lessons which call forth the effort of imagination in the most marked manner are those on such topics as the following:—a **river course**, a **railway journey**, a **coasting voyage**, the natural arrangement of **mountain ranges and river systems**, of **mountain groups and lakes**, and any lesson in which there is an attempt to construct a mental image of the geographical features of a district outside the range of direct observation. Besides the assistance which model and graphic statement afford the imagination, is that obtained through drawings, photographs, pictures of natural scenery, and specimens of natural objects.

4. **Reasoning.**—The truths of physical geography may be established *inductively* by a careful examination of examples, and when established these become of universal application. Both exercises—the inductive and deductive respectively—should form a portion of most lessons in geography, and thus give opportunity for operations in simple processes of reasoning.*

Simple forms of inference may be attempted at an early stage, as, for example, the reasons for (1) Promontories on the coast; (2) An indented coast line; (3) Certain industries in given localities. A scientific explanation of climate, of the theories of winds, of tides, and of phenomena dependent upon astronomical considerations, belongs to a late period of school life.

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* For illustrations of both inductive and deductive reasoning in the geography lesson, see pp. 64 and 67.

The formation of Valleys and Hills.

*Information.**

A. Contrast between hilly districts and adjacent plains.

(*a*) Lincolnshire is almost a dead level in the south-east. It forms here an extension northwards of the 'Bedford level.' This district is called the 'Fens.'

(*b*) In the centre and west, Lincolnshire is hilly. The Wolds in the north and centre, and the cliff range in the west, with the valleys between these hill ranges, make this part of Lincolnshire very uneven. The term 'undulating' is applied to these uneven areas.

(*c*) In other counties similar contrasts may be formed, *e.g.*,

1. The Cheshire plain in the centre and west of Cheshire contrasts with the hilly flanks of the Pennine chain in the east.

2. The plain of Holderness in the south-east of Yorkshire with the Wolds district in the north-east.

3. The Vale of York in the centre of Yorkshire with the Cleveland hills on the east, and the 'dales' on the west.

B. How valleys are formed.

Observations which children may make.

(*a*) Water falling as rain on a nearly level area soon forms hollows into which it collects. After a heavy shower it flows over the surface in little watercourses termed *runnels*.

(*b*) Succeeding showers fall, and the water rushes along the runnels, carrying away the loose sand and mud on the sides and the bed, thus deepening the channel.

The effect of this wearing action on the bed would be a deep gully or ravine if the stream alone acted. At the same time, however, the sides are loosened and thus they are also washed down by the rain.

By means of figs. 3 and 4 this double action, viz., that on the bed, and that on the sides may be illustrated.

* The district best known to the class should be selected in place of Lincolnshire. The above method may be adopted with almost every district.

Illustrations, &c.

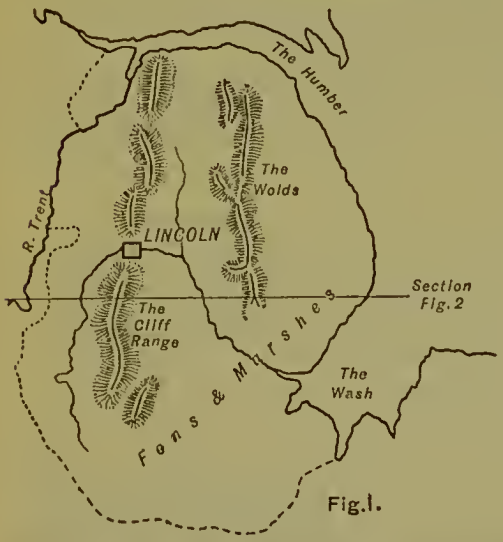


Fig. 1.

A. (*a*) Teach by means of sketch map (fig. 1).

Use also a roughly constructed sand model of Lincolnshire.

If the sand be slightly moistened it can very readily be worked into a good representation of hill and valley structure.

(*b*) Use the model, and in addition draw a section across the county rom cast to west. (Fig. 2.)

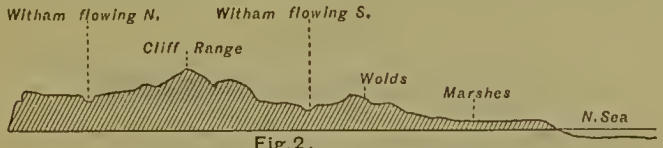


Fig. 2.

A section across the centre of Lincolnshire.

(*c*) Point out the position of each district on the map of England, and particularly impress the class with the close connection between each range of hills and the valley at its side.

B. (*a*) Direct attention to the playground after a heavy shower: these watercourses are then distinctly visible.

Roads and streets are constructed with slopes towards the sides, to prevent the water running in long streams in the direction of the road. The short stream from the crown to the sides of the road never gathers sufficient water to wear out great hollows.

(*b*) Illustrate by means of the following diagrams.

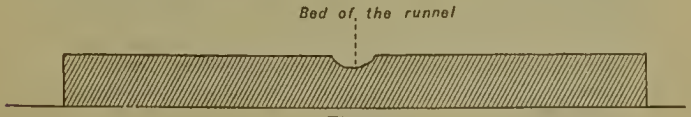


Fig. 3.

Fig. 3. The runnel when first formed on almost level land.

(*c*) If this work of running water is allowed to continue, the runnel gradually widens and deepens until the area which was almost level becomes very uneven. A valley, or a series of valleys, with intervening high land is the result.

This double action illustrates the formation of valleys in undulating districts. These valleys are sometimes miles in width, at other times they are quite narrow and are then termed 'gorges.'

C. What becomes of the material removed by the runnel.

(*a*) The muddy appearance of the water shows that the small particles of soil are being carried from high to lower levels.

(*b*) Larger particles which the water is unable to float are pushed along the bed of the stream.

This work is greater than we often suppose. It is generally done out of our sight, and only in very shallow and rapid streams can it be detected.

(*c*) When the muddy materials reach the end of the runnel they collect in hollows and fill them; should, however, the runnel enter a larger stream flowing slowly along, then the mud and sand sink, and gradually form a bank at the end of the runnel.

LESSON II.

Information and its Arrangement.

A. Introduction.

In Lesson I. the formation of channels on a small scale after heavy showers was explained. The continued action of running water upon an almost level area was then observed to change that area into one crossed by minute valleys with intervening and higher land.

B. Operations continued beyond the range of simple observation and requiring efforts of imagination and inference.

(*a*) The water-course, if long continued, will scoop out a deep channel.

(*b*) At the same time the sides of the channel become worn down, and thus a gentle slope is formed, extending from the high land towards the bed of the river. In nature these slopes, from the original level to the existing stream, are often miles in length. They are common in most hilly districts.

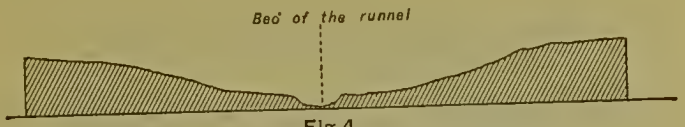


Fig.4.

Fig. 4. The runnel deepening its bed and widening its valley.

(*c*) A model made of moistened sand, with a surface almost flat, should be now used. Gradually take away sand along certain lines, and allow the class to help in modelling out the series of valleys and hills.

If water be poured from a jug upon the sand model it will flow down any incline and wear out a deep gully with steep sides.

C. (*a*) This is further seen after the water has evaporated, leaving a thick, muddy deposit in the hollows by the roadside.

(*b*) Pebbles and small stones may sometimes be thus rolled along by a small stream. Their rounded edges help in this motion, and at the same time become more round.

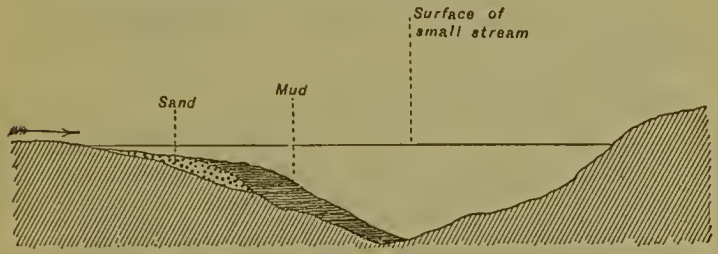


Fig.5.

Fig. 5. Deposit of sand and mud brought down by a runnel and deposited in a larger stream. The runnel enters in the direction of the arrow.

Illustrations, Examples, &c.

A. These facts will readily be recalled by the aid of the models and diagrams used in Lesson I.

A good foundation of observed results will thus be laid, upon which the higher mental operations required in this lesson may be based.

B. (*a*) and (*b*).

Fig. 1. Section across a valley. The width of the valley is about 2½ miles. Most localities present examples of valleys similarly formed.

The observation made of the hollow formed in the playground by the runnel during a heavy shower must be recalled. The same force at work during many years has scooped out the valley in the sketch.

(*c*) When these slopes extend long distances on either side of the valley fresh water-courses are formed along them.

(*d*) These water-courses scoop out new valleys, which run at varying angles with the direction of the parent valley.

(*e*) TERMS :—The hollows formed along the side slopes of an old valley are termed SECONDARY VALLEYS. The streams in these secondary valleys are generally TRIBUTARIES. They are tributaries of the river draining the first formed or PRIMARY VALLEY.

N.B.—The high land between two river basins is termed a *watershed.*

C. Examples of valleys in England formed mainly by water-action.

(*a*) The valleys called '*dales*,' on the east and west slopes of the Pennine Range. The rivers which have formed these northern dales are—(1) the Tyne, Wear, and Tees, in *Durham;* (2) Ure, Nidd, Wharfe, Aire, Calder, and Don, in *Yorkshire;* (3) the Eden, Lune, Ribble, and Mersey, *on the west.*

(*b*) In the South of England the Thames has carved a beautiful valley, and its many tributaries have hollowed out the secondary valleys they drain.

N.B.—The entire area drained by a river and its tributaries is termed a *river basin.*

Summary—

1. Hills and valleys are frequently associated, as in Lincolnshire, Cheshire, Yorkshire, &c.
2. Runnels are formed by a heavy shower of rain falling upon and running over the ground.
3. Running water wears away a small channel, and if this is continued a wide hollow is formed.
4. The material carried down by running water settles in deep and still water.
5. By the continued action of running water a valley is formed.
6. As the valley deepens the sides broaden, and sometimes the sides are a mile or more in width.
7. When the sloping sides become sufficiently wide other streams carve valleys upon them. **These are secondary valleys.**
8. The streams running down the secondary valleys form tributaries to the main stream **which runs down the primary valley.**
9. The 'dales' of the six northern counties are examples of secondary valleys, carved out by the action of running water.

(*c*) and (*d*).

Fig. 2. Sketch-map showing a primary valley, and several secondary valleys, with intervening ridges of hills.

Note.—The valleys running westward from the Cotswolds into the Severn are examples of *secondary* valleys entering a *primary* valley.

(*c*) A model of Yorkshire accompanied by a sketch-map will fully illustrate the formation of both primary and secondary valleys with intervening hill ranges. These latter illustrate the term 'Watershed.'

C. (*a*) A sketch-map of the six northern counties, showing the distribution of hill ranges and streams, will illustrate this information.

N.B.—For young children, the model roughly moulded in moist sand is most helpful.

(*b*) Allow the class to select from an ordinary wall-map the primary and secondary valleys in the Thames basin.

A complete review of both lessons may be taken at the close.

Questions for Examination.

1. Enumerate counties in England in which some portions are hilly whilst other portions are flat.
2. What change does running water soon effect on the surface of a gravel playground?
3. What prevents the hollows worn out by running water from becoming deep and narrow gullies?
4. Show by diagrams the gradual widening as well as deepening of a valley in process of formation by the action of rain and running water.
5. Show by the aid of a diagram the mode in which sand and mud become arranged when a small and muddy stream enters either a lake or larger stream.
6. How are 'secondary' valleys formed?
7. What are the streams generally called which occupy these secondary valleys?
8. Draw a sketch map of any district of England well known to you, and indicate (*a*) the primary valley, (*b*) the secondary valleys, (*c*) the parent river, (*d*) its tributaries.

Day and Night.*

Experiments and the truths they teach.

A. Experiment with a lamp and ball.

Place a lighted lamp on a table. Then take a large ball and enclose the half of it turned away from the lamp in a paper screen in the form of a cylinder.

Turn the ball round slowly until a point A returns to its first position opposite the light, as illustrated by the sketch, fig. 1.

Results to be observed and stated :—

One half of the ball is always in the light and one half in the dark.

Every point on the surface of the ball is, in turn, half its journey round, in the light ; and half in the dark.

The results ought to be stated by the class in answer to questions. If the class cannot state them the experiments must be repeated until the results are known and stated.

B. Repetition of the above experiment by means of the globe and a light, in explanation of the recurrence of day and night.

1. Take an ordinary terrestrial globe and hold it in front of the light. The scholars are to imagine that the light is the sun and the globe is the earth. The following truth is in this way illustrated and should be stated, viz. :—

That one half of the globe is in the light and this portion represents day ; the opposite half of the globe is in the shade and this portion represents night.

2. Turn the globe slowly round until the point directly in front of the light returns again to the same position. The globe has rotated once and as a result it should be evident to the class that :—

Any place on the rotating globe travels half round in the light, *i.e.*, *in the day*, and half round in the dark, *i.e.*, *in the night.*

* Copied from '*Graphic Lessons in Physical and Astronomical Geography.*'

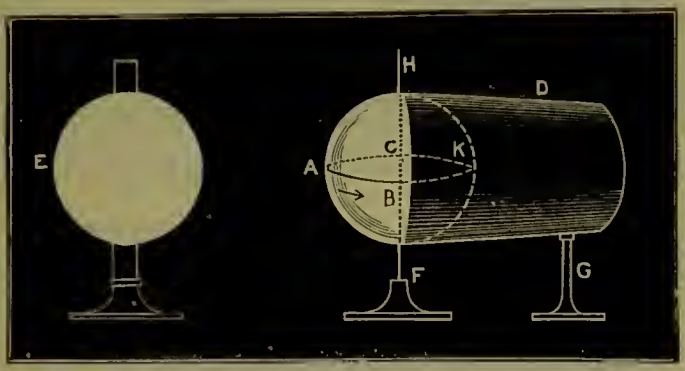
Illustrations and how to use them.

A. Fig. 1. Sketch of a simple model designed to perform experiment 1.

E is an ordinary lamp.

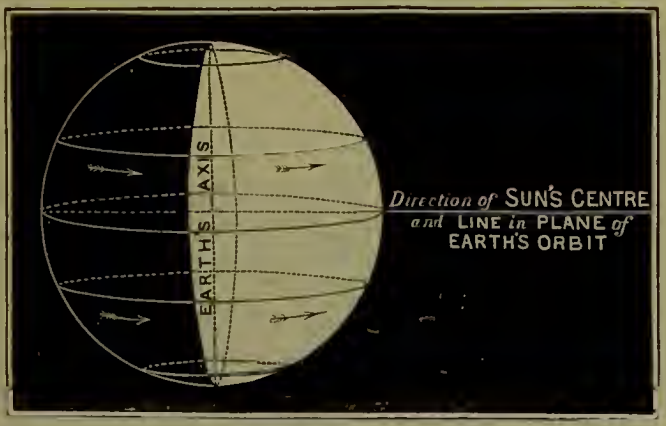
A is a ball about the same size as the globe of the lamp.

D is a paper screen representing the shadow which covers one half of the ball and stretches away behind it.



F and **G** are wire mounts. They hold the ball and the screen in position and allow the teacher's hands to be free to turn the ball by means of the extended wire at **H**.

N.B.—This lesson is often spoiled by the teacher attempting to hold his apparatus in his hands whilst giving the lesson.



B. Fig. 2. A globe held before a light to show the light and the dark parts respectively. Then slowly rotated to illustrate the change from night to day and *vice versa*.

This is a slight variation of experiment 1. Only slow progress must be expected in this lesson, and only by a series of graduated experiments such as these can the class be led to grasp the movements of the earth, which on account of their magnitude are beyond the actual observation of the learner.

The truths taught are not perfectly grasped until they can be stated in the scholar's own words.

C. **The beginning, end, and course of a point on the globe in the light and in the dark respectively.**

1. Select a point on the dark half of the globe and then slowly rotate towards the lighted portion of the globe. The class to watch carefully and state when the light is first seen from the point selected.
2. Turn the point round in the same direction until the light is ready to disappear. The class, or some member of it, to state when the light becomes hid from view.
3. The course over which the point has been carried from the position where the light became first visible to that where it disappeared is the light or *day* course. Thence round again to the light is the dark or *night* course.

These statements can be obtained from the class by following the direction given on the right hand page.

D. **Application of the above truths in explanation of the chief phenomena of day and night.**

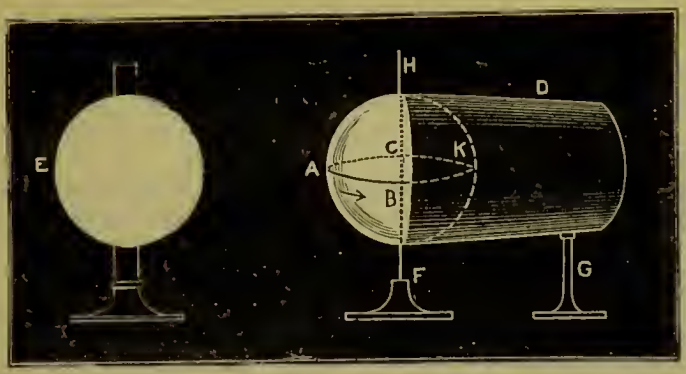
1. *Apparent movements.*
The sun rises every morning in the east, passes across the heavens and then sets in the west. **The progress of the sun over the sky from rising to setting forms the Day.** After the sun has set in the west, darkness begins and continues until the sun reappears the following morning in the east ; **this interval of darkness forms the Night.**
2. *Real movements causing day and night.*
The earth by its rotation causes the sun to rise and to appear to cross the heavens and then to set in the west, and this movement of the earth **causes the recurrence of day and night.**

E. **Terms and definitions.**

1. *Diurnal movement* is the name given to the rotatory motion of the earth which causes day and night.
2. *Axis.* In rotating a ball or globe there is a line running through the sphere which does not move. **This line of no movement is the axis.**
3. *Poles.* The ends of this axis on the earth's surface are termed the north and south poles respectively.

Summary—

1. A sphere or ball when turned towards the light has one half its surface in the light ; the other half is in the dark.
2. By rotating the ball every place in turn is half its journey in the light and the remaining half in the dark.
3. Similarly a globe representing the earth may be shown to be half in the light and half in the dark, and by rotating the globe, every place moves half its course in the light and half in the dark. **The light course represents the day, the dark course the night.**
4. The sun appears to rise, to cross the heavens, and to set.
5. These appearances are due to the earth rotating once every twenty-four hours.
6. This rotatory motion is called the diurnal movement. The line of no movement is called the earth's axis. The ends of this axis are the poles.



C. Fig. 3. Use the model again first presented to the class.

Direct attention to K. As this cannot be seen on account of the screen, its position may be noted by means of a diagram like the above drawing made on the blackboard.

1. Bring slowly the point K from beneath the screen to C, where the light first becomes visible.

   Repeat this operation by allowing different scholars to turn the ball by the wire at H until the letter K marked on the ball comes into the light.

2. Similarly allow members of the class to rotate the ball until various points selected by themselves are brought to the position where the light disappears.

3. Then allow others to take a place through the entire **light** course; and similarly through the **dark** course.

D. 1. The scholars observe these apparent movements many days in the year, and although they may not be able to give reasons for them they will state the facts in reply to the teacher's questioning.

The children must be encouraged to state their notions of a complete day and night in their own words, the teacher should perfect their statement only when the notions which are being taught are evidently grasped. Full statements such as those on the left may afterwards be written on the board and repeated by the class.

Fig. 4. A globe half enclosed in a screen to be used in the same way as the ball in Fig. 3. The scholars to indicate positions at which the sun is *rising* and *setting*, also where it is *midday* and where it is *midnight* on the globe at the same time.

2. By contrast with a globe that is stationary, bring out the notion that in order to cause the sun to rise and set at any place **the globe must rotate.**

E. Supply the term for this rotatory movement and show the position of the **axis** and **poles.** The class should be encouraged to attempt simple definitions of each of the terms stated.

LESSONS IN GRAMMAR.

Introductory.—The subjects of school instruction hitherto considered have been found to yield a two-fold result, viz. (1) there has been the accumulation of information, and (2) there has been intellectual training. Every subject, however, whilst it secures both the above effects, does not yield these results in an equal amount. Reading, for example, is largely of service for the information it yields; writing for its practical value; arithmetic is perhaps equally valuable as a practical art and as an intellectual discipline; and geography is of most value for the information its study secures. Lessons in English grammar are of use, not so much for the knowledge they yield as for the intellectual discipline they afford.

How the correct use of the mother tongue is mainly acquired.—English is spoken correctly or otherwise chiefly by imitation of the language as it is used by others. If, therefore, we wish to enable our pupils to speak correctly we secure this end best by the following amongst other means:—

i. By the use of correct speech in their presence both in the school and in the home.

ii. By plenty of exercise in reading good authors, and by committing to memory choice passages of poetry.

iii. By practising them as frequently as possible in the use of good language, as, *e.g.* by the following school exercises:—

(*a*) Answering questions in full and complete sentences.

(*b*) Simple composition exercises upon lessons previously taught, or a narrative just read.

(*c*) Correcting all errors in statements both oral and written.

'The direct operation and use of grammar rules in improving our speech and making it correct,' says Dr. Fitch, 'can hardly be said to exist at all. For we all learn to speak the English language in one fashion or another without the aid of books.

Some of the best and purest speakers of the language have either never learned grammar, or are not in any way consciously guided to correct speech by a knowledge of grammatical rules. They have learned to use their own language *by using it*, by imitation and habit, and by the fine intuition which has led them to imitate good models rather than bad.'

All teaching of an oral character may be made a means for the teacher moulding the speech of his class. During the entire effort, as many as sixty scholars, it may be, are listening to all his utterances. His statements become models for their imitation; the varying tones of his voice serve also to convey those fine distinctions in meaning which are not only heard, but are reproduced by the scholars when they in turn are called upon to speak. In these oral lessons the pupils not only listen to the best models of speech the school offers, but in turn they are encouraged to speak themselves, care being taken that in these attempts at expression they make clear, complete and correct statements.

The Grammar Lesson as a means of Intellectual Discipline.—It is not necessary at this stage of enquiry to discuss the question of priority for lessons in the structure of sentences above those upon the classification of words; the intellectual operations do not materially differ, whether sentences or words are first considered. Our object now is to find, by means of a series of simple examples in teaching, the form of intellectual effort which each example affords.

Example of teaching the classification of nouns and verbs.—Place a number of simple sentences like the following before the class.

Rain falls	**Children** play
Dogs bark	**Ice** floats

The first step in the lesson is to distinguish the words which stand for *things* from those which stand for *actions*. The teacher needs only to start his class along the line of thought he wishes them to take. He does this by taking the first sentence and telling the class that 'rain' is the name of a thing, but 'falls' is not. What does it stand for? The class will now readily and with very little direction from the teacher proceed to arrange the words in all the four sentences in two classes, viz.:—

Words standing for things.	Words standing for actions.

This step may be followed by one in which the pupils construct simple sentences, introducing both classes of names, the children in each case to place the names in the column to which they belong. After a few examples supplied by the class, an essential distinction between the two most important classes of words is established, although the full grammatical notion may not in either case be completed; sufficient knowledge of each class has, however, been conveyed for the introduction of the new terms *noun* and *verb*.

In answer to such questions as (1) What is a noun? (2) What is a verb? the outline of a definition of each part of speech may be expected from the class, and the exercise completed by the scholars selecting words belonging to each group from their reading lesson for the day.

The intellectual exercises in the lesson sketched above are as follows:—

1. The use of the words in each sentence has been *contrasted.*

   This is the intellectual operation termed '**Discrimination**' or the recognition of difference.

2. The four sentences have yielded two distinct groups of words each of which furnishes material for the exercise of *classification.*

   The essential effort of intellect in the formation of these groups or classes of words is '**Assimilation**' or identifying similarities.

3. When the words constituting each class are compared they are found to be united by a single common quality or feature, viz., in the one case they are 'names of things,' in the other they 'indicate actions.'

   Each class of words has other qualities or features not common to the whole group, *e.g.*, the length of the words, and the spelling, whether names of animate or inanimate objects, &c.; these, however, are disregarded, and the attention is fixed upon the one characteristic quality or feature which each class respectively presents.

   The intellectual exercise of turning the mind from the consideration of certain qualities or features is clearly of the same nature as that termed **abstraction** in the formation of the general notion, *and the effort of fixing attention upon the common quality or feature* in the class of words leads to the formation of a **generalization.**

4. The word 'Noun' represents the grammatical notion arrived at by the succession of intellectual operations just enumerated, and the definition 'a noun is the name of anything' sets out in the form of a proposition the full meaning of the term, so far as the lesson has determined that meaning.

   If the young teacher refer to pp. 51—53, he will at once see how closely the whole of the above series of intellectual efforts resembles those used in forming the 'general notion.' Instead of resting upon a knowledge of particular objects, however, as is the case in forming a general notion, the entire set of intellectual operations —comparison, abstraction and generalization—is based upon a knowledge of words, and that, not of their spelling or pronunciation, but of the value of each word in the structure of a sentence viewed as an expression of thought.

Practical suggestions for the preparation of Grammar Lessons based upon the nature of the intellectual exercises.

1. It is evident that no progress of an educational kind is possible, in the formal study of grammar, until a considerable advance has been made in the use of language.

The advance of the child from the particular and *concrete* knowledge gained by perception and retained by memory to the general and *abstract* knowledge represented by the concept, rests upon a considerable acquaintance with individual objects obtained by actual contact with them. Until this acquaintance has been made, progress is impossible. In the same way an acquaintance with words as they are used in language both oral and written is the necessary preparation for determining their classification into 'Parts of Speech.'

It should be noted also that the acquaintance here indicated is not that of ability to pronounce or spell a word as in the mechanical exercise of reading, but the power to understand the use and value of each word as it takes its place in the structure of the sentence. **Intelligent reading**, therefore, is an indication of that acquaintance with words and sentences which should precede the formal study of grammar.

2. Lessons should be arranged on the inductive method of teaching, *i.e.*, they should consist in the first place of examples, and out of these the class should be encouraged to form 'definitions' and 'rules,' mainly by their own efforts of comparison and generalization.

For Example, in the lesson upon the 'General rule for forming the plural of nouns,' the following order should be adopted.

Examples and truths they teach.	Hints upon the Method of Teaching.
A.	A.
1. The landlord's house is damp.	Read the first sentence in each group and allow the class in answer to questions to state :—
2. The farmer's horse is strong.	(*a*) The difference in meaning between each sentence.
3. The tree is beautiful.	(*b*) The difference in form.
Changed to :	Encourage the class to supply other examples after the pattern of those first given, and underline the letter 's' in the plural nouns.
1. The landlord's houses are damp.	
2. The farmer's horses are strong.	
3. The trees are beautiful.	

B.

(*a*) *Results of Comparison.* — **The noun standing for 'one' is changed by the addition of 's' to indicate 'more than one.'**

(*b*) *Terms used to indicate these results.*

Singular Number is used when one object is named.

Plural Number is used when more than one is named.

(*c*) *Rule or Principle established.* — **Singular nouns are changed to the plural by the addition of 's.'**

B.

(*a*) The result of the act of comparison should be announced by the class. If it cannot be done at first, other examples must be supplied until success is achieved.

(*b*) These terms 'singular' and 'plural' are supplied by the teacher.

(*c*) This rule will be stated in answer to the question: How do you form the plural from the singular? When correctly stated it should be committed to memory.

3. Examples supplied for the consideration of the class during the teaching of Grammar should consist of complete sentences rather than isolated words. This method of teaching secures the following amongst other advantages:—

   (*a*) The full significance of a word as a 'part of speech' can frequently be detected only by its force in a completed sentence.

   (*b*) The cases of nouns, and the different parts of speech which the same word frequently assumes, can only be determined by this method.

   (*c*) The pupils are in danger of confounding the word with the thing for which it stands, when the word is used in its isolated form.

   (*d*) When other words are joined to the one under discussion, the full advantage of contrast as a teaching device is utilised.

   (*e*) The practice of considering words as they are related to one another in sentences, and especially the effort to form complete statements on the part of the scholar, is a valuable training in the use of language.

4. The introduction of Grammatical 'terms,' 'definitions,' and 'rules' should be delayed until the notions, or truths which they embody, have been taught.

   A lesson should never begin with a definition. One of the oldest maxims in teaching is '*never to supply a term until it is required*,' and in no lessons should this maxim be followed more consistently than in the Grammar lesson.

5. The Grammar lesson should be followed by exercises* in the application of the rules and truths taught. These may be simple parsing lessons or lessons in the analysis of sentences.

The value of the parsing lesson is greatly increased by frequent appeals to the pupils to name either the rule or definition which they are applying—Why is this word a noun? Why in the nominative case?—are forms of questioning which should be frequently heard during the parsing lesson.

It should be noted here that the exercises of picking out 'parts of speech,' and of fully parsing or analysing a sentence, are efforts which, instead of advancing from the consideration of examples to the establishment of rules (as in the inductive method), proceed from the rules already established to their application to new examples. The parsing lesson for this reason is frequently termed a '**deductive exercise.**'

The notes of a parsing lesson may be arranged in the following way:—

1. **Introduction.**—This consists of reading over the passage to be parsed. It should be written out in full on the notes, and in the actual lesson may be first read and then analysed so far as to indicate the chief parts of the sentence and their accessories.

2. **The Parsing lesson.**

This may be arranged as follows :—

Words in order of parsing.	Full parsing of each.	Faults anticipated, and Mode of dealing with each.
1.		
2.		
3.		
4.		

3. **Revision** of the chief points taught during the lesson.

* 'The general object of lessons in English should be to exercise the thinking powers, to enlarge the learner's vocabulary, and to make him familiar with the meaning, the structure, the grammatical and logical relations, and the right use of words. From the first the teaching of the English language should be supplemented by simple exercises in composition, *e.g.*, when a word is defined the scholar should be called on to use it in a sentence of his own; when a grammatical principle is explained he should be asked to frame a sentence showing how it is to be applied, and examples of the way in which adjectives are formed from nouns or nouns from verbs, by the addition of syllables, should be applied or selected by the scholars themselves, mere instruction in the terminology of grammar, unless followed up by practical exercises in the use of language, cannot be expected to yield very satisfactory results.'—*Instructions to Inspectors.*

Specimen Notes of a portion of a Lesson on the ADVERB.

Examples and Definitions.	Teaching Suggestions.
A. Preparatory Sentences. 1. The children work. 2. The horses galloped. 3. Alfred ruled England. 4. The scholars respected him. Changed to :— 1. The children work merrily. 2. The horses galloped quickly. 3. Alfred ruled England well. 4. The scholars respected him much.	A. Write these sentences on the board and ask the class to indicate in each case (1) the name of the action, (2) the name of the doer ; thus prepare for the additions in the next set of sentences. The first example may be extended by the teacher, thus, 'children sometimes work *quickly* and *well* ; sometimes the work is done *slowly* and not *well* ; to-day we will say the work is done *merrily*.' Now ask the children to extend each of the sentences, 2, 3, and 4, and to make other sentences of their own containing similar additions to the verb. Carefully select verbs requiring other adverbs than those ending in '*ly*.'
B. Truth taught.—Words are added to a verb to tell more about the action which it expresses. Such words are termed *adverbs*.	B. Allow the class to :— 1. Name all the added words. 2. State the part of speech they tell something about. 3. What they do to the verb. The teacher must supply the name '*adverb*.'
C. Definition. — An adverb is a word used to modify the meaning of a verb.	C. The children to state the definition.

The order in which lessons in grammar are to be arranged.—It has already been stated that children should have a good acquaintance with language, both oral and written, before they attempt the formal study of grammar. It has also been shown that when lessons in grammar are commenced they should uniformly present their illustrative examples in the form of complete sentences. The following order of lessons and accompaniment of suggested method, by Dr. Fitch, puts the disputed question of '*words versus sentences*' in a way which completely commends itself to most practical teachers. He says*—

* Lectures on Teaching, p. 262.

'One of your earliest lessons consists of a view of the parts of speech. The books would have you begin by saying there are nine of them, and by requiring the pupil to learn by heart the definition and some examples of each. But it is surely a much more rational method to begin with a sentence which the scholar already understands, and so to draw from him the simple facts that in using language there are two essential conditions, viz.,

(1) That we have something to talk about;
(2) That we should have something to say.

You may illustrate this by taking a little sentence, *The child sleeps*, as a type, and you say that the former word is called the Subject, or the thing talked about, and is a *Noun*, and the latter the Predicate, the thing said, and is a *Verb*.

Then you point out that each of these words admits of extension, and takes an attribute :

The *little* child sleeps *soundly*,

and you show that the one word enlarges the subject and the other the predicate. You then invite the scholars to give you other sentences containing the same elements, and, after a few examples, you give names to the words which fulfil these two functions, and call the one an *Adjective*, and the other an *Adverb*.

Then you seek to attach other notions to the first, and you do this in two ways :

The child sleeps *on* the bed.
The child sleeps *because* he is tired.

In the former case you have added a word, in the latter a new sentence, the nature of the connection thus established being shown by the word in italics. Hence is deduced the necessity for two sorts of connective words the *Preposition* which attaches a noun, and the *Conjunction* which attaches a sentence to what has gone before.

These are the six essential elements of organized speech, and the logical order of their importance is—

1. Subject ... ... *Noun.*	3. Adjunct to Subject ... *Adjective.*
2. Predicate ... ... *Verb.*	4. Do. Predicate... *Adverb.*

5. Connective of word ... ... *Preposition.*
6. Connective of sentence ... *Conjunction.*

Then you go on to show that you have not exhausted all the words in the language, but that there remains :—

1. The **Pronoun**, whose use you illustrate by examples. It is not a new element in language, but is simply used as a convenient substitute for a noun in certain cases.
2. The **Article**, which is seen to be a kind of adjective used in a very special sense.

   You show that these two, though useful, are not indispensable, and that Latin did without the last altogether.

Lastly, you point out that what is often called the ninth part of speech, the **Interjection**, is in fact not a part of speech at all, but, as Horne Tooke called it, 'the miserable refuge of the speechless.'

Mr. D. F. Fearon, formerly one of Her Majesty's Inspectors of Schools, writing on the same subject says *:—

'The proper way to teach English grammar is not to begin, as in the case of Latin, or of any other highly inflected language, with the study of the noun, adjective and verb, and their inflexions, but to begin with the study of their logical relations; or, in other words, *to begin with the analysis of sentences*. It is absurd to waste time over learning the cases of nouns which have lost all their case endings, and have substituted for those case endings structural position, or logical relation in the sentence. What is wanted is to get as quickly as possible a notion of the structure of the sentence, and of the logical relation of its parts. And for this purpose the teaching of English grammar should be begun, and based throughout its course, on the analysis of sentences. The teacher should, immediately after imparting the first elementary notions and general definitions, proceed to the subject and predicate, beginning with the *noun* and *pronoun* as the subject, and with *intransitive verbs* as verbs of complete predication.

He should then pass on to the direct objective relations of nouns and pronouns with verbs of incomplete predication, introducing no more study of case endings than is absolutely necessary for the purposes of the pronouns; *number*, *gender*, *person*, *tense*, *mood*, and *voice* should be taught as modifications of these relations.

Having thoroughly worked these forms and relations of the noun, pronoun, and verb, always by means of the structure of a simple sentence, the teacher should proceed to the enlargement of the subject, and thereby introduce for the first time the so-called *possessive case* ending of nouns and *personal pronouns*, the *adjective*, the *noun in apposition*, the *possessive pronouns*, and the *participle*.

Having treated of the simplest forms of enlargement of the subject, he should proceed to the simplest forms of extension of the predicate. In this relation he should first introduce the *adverb*, showing its use both for extending the predicate and by means of the *adjective* for further enlarging the subject. He should then introduce the indirect objective relation of nouns and pronouns (such as that which is called, by analogy with Latin, the dative case), always as a means of extending the predicate.

> All through this course of teaching it is an essential thing that the children should be required to make and form simple sentences in various ways, so as thoroughly to understand the practical application of what they are learning to the art of speaking and writing correctly.

The teacher should then go on, by way of further extension of the predicate, and of further enlargement of the subject, to the use of the *preposition* with nouns and pronouns. After this he should proceed to easy types of complex sentences; teaching the children the use of the subordinate sentence, and therewith introducing to them for the first time the *conjunction*, the *relative pronoun*, and those words such as *why* which answer the purpose of a relative pronoun and preposition

* School Inspection, p. 47.

combined. By this means, he will be able to teach them to distinguish with confidence between the several uses of words, such as those words which are sometimes used as prepositions and sometimes as conjunctions; those which are sometimes used as conjunctions, and sometimes as relative pronouns, and the like.

Having thus given the children their first notions of the relations of a subordinate to a principal sentence, he should then return to the simple sentence, and should instruct the children in the various kinds of phrases, in the more difficult uses of the participle, and in the nature and functions of interjections; and after this should go back once more to the complex sentence, and carry on his teaching into the different kinds of subordinate sentences; being extremely careful at this point of his teaching to ascertain that the children see clearly the reason why any given subordinate sentence is substantival, adjectival, or adverbial, by making them always point out the word in the principal sentence upon which the subordinate sentence depends.'

Advantages of this method.—'Some persons may think that this way of teaching English grammar, by means, that is to say, of logical analysis, is more difficult for children than the old method of teaching it by a system of supposed inflections, and of parsing those inflections, based on the analogy of Latin, and may imagine that it will be found too difficult for children in our elementary schools. I am perfectly convinced from observation and experience, both as an inspector and as a teacher, that this is not the case. The technical terms which it is necessary to use in teaching grammatical analysis are neither more nor less difficult in themselves than those which it is necessary to employ in teaching arithmetic, geography, or book-keeping; and they are not more difficult than the terms which it is necessary to use in teaching grammar on the old system. As regards all such terms, whether employed in the teaching of book-keeping, or of analysis of sentences, the great point is to make the children have an intelligent understanding of the real things which underlie them, and which they represent, and this can be satisfactorily done in the case of English grammar only by means of analysis. Moreover, teachers who adopt this mode of teaching English grammar will find that the power of getting quickly at the sentence is of immense advantage as a means of interesting the children and engaging their attention in what must otherwise appear to them a most dry and unprofitable study.'

Alternative Courses in English.—Since writing the above, the Code of 1890 has introduced many changes in the 'English Course.' These changes are in thorough harmony with the opinions stated in the preceding pages. For example, the Alternative Course A up to Standard V. is exactly on the lines sketched by Dr. Fitch, and quoted above; again, the Alternative Course B is precisely in accord with the suggestions made on page 183, the formal study of grammar being delayed until the learner has acquired a good knowledge of language and has had considerable practice in the use of sentences both written and spoken.

'My Lords believe that greater variety might with advantage be secured in the *class* instruction. For example, in one school the teacher of English attaches more importance to the analysis of sentences, as an intellectual exercise, than to grammatical parsing; in another, oral and written composition, and the correction of common errors in the formation of sentences are believed to be the most useful forms of exercise in English.'

SPECIMEN NOTES OF A LESSON ON 'VOICE.'

EXAMPLES AND TRUTHS.

1. Introductory Revision.

(a) Examples.

The girl is playing.
The horse ran away.
John came home to-day.

(b) Truths.

The *Subject* of a sentence is the person or thing about which something is said; the *Predicate* is that which is said about the subject.

2. A comparison of the different relations which the subject may bear to the predicate.

(a) Examples.

(1.) The boy saw his father.
(2.) The boy was seen by his father.
(3.) The teacher loves his children.
(4.) The teacher is loved by his children.

(b) Truth taught.

The same word as subject sometimes denotes the doer of the action, and sometimes the person or thing acted upon.

3. The means of expressing these different relations, viz., Voice.

SENTENCES (a).	SENTENCES (b).
The subj. denotes the doer of the action.	The subj. denotes the sufferer of the action.

The subject is the same word in each case. Whether the subject, however, is the doer or the sufferer of the action is shown by the *form* of the verb.

Thus Voice is a change in the *form* of the verb to denote whether the subject is the doer or the sufferer of the action.

METHOD OF TREATING THEM.

Supply examples like the accompanying, and ask the children to pick out by means of previous teaching the Subject and Predicate in each sentence. Encourage the Scholars to construct similar sentences and to analyse them. Ask for definitions of Subject and Predicate.

Contrast sentences (1) and (3) with (2) and (4) and thus lead the scholars to see that in the former pair the Subject denotes the doer of the action, whilst in the latter pair the Subject is the name of the person upon whom the action is performed.

Introduce the term 'sufferer of the action' in place of the phrase 'person upon whom,' &c.

Give exercises as a means of revision, the teacher at first supplying the *active* form, and the children making the change to the *passive* form.

Again contrast sentences (1) and (3) with sentences (2) and (4). The children will at once see that the difference between them is not due to any change in the form of the subject. By asking them to look where the changes in form take place, and, if necessary, by supplying the class with more illustrative examples, they may be led to see that the difference in the two sets of examples is shown by a change in the form of the verb.

Now give the name of this change, viz., Voice.

The definition, in outline, should be supplied by the class.

4. Kinds of Voice.

When the subject is the doer of the action the verb is in the **Active Voice**, as in (1) and (3) above. When the subject is the sufferer of the action the verb is in the **Passive Voice**, as in (2) and (4).

Introduce now the terms 'active' and 'passive,' and encourage the children to attempt to explain them.

Supply some new sentences and require the class to say in what voice the verb is in each case; and also give them exercises in forming original sentences.

These exercises will form an excellent revision of the lesson.

LESSONS IN HISTORY.

Introduction.—The teaching of history can scarcely be said to have a place in our elementary schools. Whilst 20,000 schools take English, and over 15,000 geography, only about 380 attempt history as a class subject. This, however, does not fairly represent the entire instruction which is given in these schools, inasmuch as a suitable reading book in English history is required in Standard III. and upwards.

In the light of the facts stated above, the preparation of lessons in history cannot possess widespread interest amongst those who are preparing for the work of teaching. It may, however, be of some value to indicate briefly the place which history, as a subject of school study, holds (1) as a means of mental discipline, and (2) for guidance in the affairs of life.

The study of history—a means of mental discipline and guidance.—History stands related to political geography somewhat after the manner in which geology stands related to physical geography. In the latter case, the science of geology seeks to discover the different aspects which the physical world has assumed during past ages, and not only so, it strives to indicate the nature of the physical forces which have brought about the changes it reveals. History in like manner reproduces for us the changing aspects which the world for many centuries has presented, as the abode of man. It not only brings to light the successive development and decay of empires like Persia, Greece, Rome, and Spain, amidst the other nations of the world, and the successive changes which any selected nation like the British or the French has displayed; history not only makes these views of the past to move as it were again before our eyes, it seeks, when properly expounded, to trace the forces—social, political, and moral—which have brought about these constantly changing conditions of human life and power.

The successful study of history as a means of culture requires a considerable acquaintance with the various communities of mankind as they are now socially and politically related. 'The full bearing of history,' says Dr. Bain, 'cannot be understood without much previous knowledge, and some experience of the world, and where these requisites are found, there is little need for a teacher.' A preparation for the more formal study of history should include (1) a knowledge of political geography sufficient to place the learner in possession of the main facts concerning the character, position, and power of the chief nations on the globe. (2) A knowledge and some experience of the social relations which regulate the actions of communities, and of the political relations which regulate the actions of the state, and (3) a literary ability sufficient to enable the learner to understand a fairly difficult English author.

Without entering further into the nature of the study, it remains to pass briefly under review the various intellectual powers, and see how far these are affected by such a scheme of historical study as would be suited to the higher classes of our schools.

1. *Observation.*—Whilst the past is most readily understood by a wide observation of the present, and therefore the ability to observe the various relations—social and political—which exist amongst communities to-day is of assistance in any attempt to realise the past, there is nothing in the study itself beyond the inspection of historical remains—castles, articles of dress, furniture, &c., to exercise the observation.
2. *Memory.*—History is frequently made a mere matter of memory. Strings of dates are learned by heart, and the chief events of a period are arranged in a set order under definite and similar headings for every reign—thus presenting to the learner a mass of disconnected details which, if they are learned at all, are mastered either by frequent repetition, or by the aid of mnemonics, and when learned are used and then quickly forgotten. Instruction of this kind is of little worth for the knowledge gained and of less value for the discipline afforded. It is true that the facts of history need to be learned, and their sequence remembered ; the memory, however, will have little difficulty in retaining either, if the true connection between the facts be clearly shown. The association of the events of history so as to indicate to the learner the connection between cause and effect will be found helpful to the acquisition of sound historical knowledge, and at the same time conduce to the development of a good memory.
3. *Imagination.*—The effort to reproduce the conditions of a past age is allied to that of realizing the aspects of life and surroundings of a people whom some renowned traveller reveals to our notice for the first time. At every stage of the study of history the exercise should make a demand upon the imagination, and only those who by its activity are able to realize the past make either good teachers or apt learners of the subject.
4. *Judgment.*—The study of history provides for considerable freedom of opinion. Men and their actions, either as individuals or in communities, are constantly being subject to criticism; judgment is being passed upon them, and in accepting the judgment of others we are gradually introduced to the recognised standards by which men and

nations judge one another. Judgment, as the term is applied to the man whose advice is sought when circumstances of some complexity make it difficult to know how to act, is the form of the power which a wide acquaintance with history is calculated to produce.

5. *Reasoning.*—'History repeats itself.' Let there be certain given conditions, the effects may be estimated. The reading of history leads inductively to the establishment of broad generalizations, as, *e.g.*, the student of the history of the past fifty years cannot fail to have noticed that with every widening of the franchise there has followed almost immediately the extension of education. These generalizations, or laws of history, when established become available for reasoning deductively upon the effect of new proposals.
6. *Moral Training.*—This is a distinctive feature of history. When the actions of the good and the brave are made to live again in the recitals of history they cannot fail to stimulate and inspire to nobility of life and character, whilst the ignoble, the cowardly and the mean, re-appear to convey warning and administer reproof.

Plan of History lessons.

1. General reading of easy historical narrative—the subjects being simple biographies of notable men.

   The biographies of statesmen, warriors, kings, and other remarkable characters provide the matter out of which history is constructed. With young children the recital of the events as they occurred in the life of some great man, has a reality which attracts the attention, and when their interest is thus aroused it is not difficult to impart the historical facts and truths, connected with the character under review. A series of lessons covering the chief events in the lives of Palmerston, Wellington, Pitt, Cromwell, Cecil, Sir W. Raleigh, Wolsey, Becket, and Alfred could not fail to convey much historical knowledge in a very attractive way.

2. A general view of historical periods with more especial reference to England under Alfred, the Norman Conquest, the Reformation, and the Georges. Contrasts to be made between the conditions of life now and at each period named.
3. A special period taken in fuller detail, or the acquisition of a 'knowledge of our constitution, and of some of our national institutions, such, for instance, as parliamentary and municipal government, the poor law, trial by jury, and the constitution and powers of the principal courts of law, together with their development from earlier times. In such a course the patriotic efforts and sacrifices made by our forefathers to secure the rights we now enjoy would find their appropriate place.'

   Respecting the advantage which the study of a special period yields, Dr. Fitch writes:—'A learner who has been led to pay

special attention to one period, carries away with him from school, not only a fund of knowledge which will hold together and retain its place in the mind, but also right notions of what historical investigation really is, and of the manner in which the annals of a period should hereafter be studied. In short, it is by no means necessary that a pupil should take with him into the world all the facts of a school history, but it *is* necessary that he should be provided with a taste for historical reading, and with both the power and the disposition to study the subject systematically for himself.'

SPECIMEN NOTES OF A LESSON ON THE TIMES AND CHARACTER OF KING ALFRED.

CHIEF EVENTS IN THE LIFE OF ALFRED, AND THE TRUTHS THEY ILLUSTRATE.	HOW THESE EVENTS MAY BE IMPARTED, AND THE TRUTHS IMPRESSED.
A. Alfred's youth and training. Born at Wantage (1) A.D. 849. Taught to love reading by his mother,(2) and gained knowledge of the world and himself by travel and manly sports. He became experienced in rule by assisting his three brothers, who successively preceded him in the work of defending and governing the kingdom of Wessex.	A. 1. Show position on the map. Nearly in the centre of the Kingdom of Wessex. 2. Impress difficulty of instruction in these early times, there being no schools, and no books. Travel and private instruction the only means of gaining knowledge. 3. Enumerate Alfred's immediate predecessors, and relate how his life of hunter and student prepared him to become the warrior and ruler.
B. Alfred the Warrior. Alfred became king upon the death of Elthelred,(1) who was then in the midst of a severe conflict with the Danes. Within three years the Danes had established themselves in Mercia,(2) Northumbria, and East Anglia, and they were preparing to attack Alfred's Kingdom of Wessex. Alfred defeated the land forces at Exeter,(3) and the Danish Navy at Swanage,(4) but was afterwards himself defeated and driven into retreat on the Isle of Athelney.(5)	B. 1. State difference between succession to the throne then and now, and also how that the disturbed nature of the times required a king to lead in war as well as to rule in peace. 2. These divisions may be sketched on a map. Compare with divisions of Ireland to-day, or those of the German Empire before 1871. 3. Graphically describe the siege and the people starved into surrender. 4. Impress by stating how the fog assisted the English and caused the Danes to be wrecked on the rocks. 5. Alfred's disguise, his absorption in his kingdom's woes and consequent neglect of the baking cakes, the housewife's return and the scolding of Alfred, are incidents which arouse the scholar's interest and should be graphically told.

The next spring, after careful preparation, he marched forth and finally defeated the Danes at Ethandune. Peace followed and the Danes became Christian.(6)

Lessons.—(1) England weak because divided.

(2) Alfred's magnanimous behaviour wins for a time the hearts of his enemies.

6. Relate these events. Alfred conquered his foes. If all England had united, the defeat might have been more complete.

The second lesson is so evident that the class will scarcely need prompting to announce it.

C. Alfred the Statesman.

Alfred did not follow up his victory to pursue the further conquest of the Danes, but took advantage of the peace to secure the good government of his people :

(*a*) Made wise laws and selected the most able men to administer them. **Alfred the Just.**

(*b*) Provided the people with a literature of their own and thus began—**The education of his people.**

(*c*) Was himself an example of justice, temperance, and self-sacrifice. **Alfred the Good.**

C.

(*a*) Relate his selection of the swine-herd 'Denewulf,' afterwards Bishop of Winchester, to show Alfred's insight into character when selecting men for high position. He collected the laws together into a '*Code*.'

(*b*) Picture the condition of a people with no books or newspapers to read. Compare with inhabitants of heathen countries of to-day. Relate how Alfred superintended a school for the youth of his nobles. He also translated and annotated books of history for his pupils to read.

(*c*) Actions towards others, quoted above, show his *justice*. His *temperate* and *methodical habits* are shown by the way in which he occupied his days—$\frac{1}{3}$ for rest, $\frac{1}{3}$ for study, and $\frac{1}{3}$ for government. His *self-sacrifice* is manifest in his renouncing the luxuries of the court, and in his engaging solely in work to elevate his people. Alfred's *goodness* is apparent in almost all he did. In his own words it is finely expressed when he says, 'above all things I desire to live worthily.'

ELEMENTARY SCIENCE AND THE SPECIFIC SUBJECTS.

Introduction.—The method and aim of science instruction cannot be more briefly stated that in the following extract from the Instructions to Her Majesty's Inspectors of Schools—'If these subjects (science) are simply and thoroughly taught, the scholars will form those habits of observation, reasoning and exact statement which are needed for the intelligent conduct of life.'

Observation and Experiment *versus* **Bookwork.**—The value of gaining knowledge, direct and first hand, from actual inspection of objects, and from the performance of experiments, has been repeatedly enforced in preceding pages of this book. The advantages of this method of instruction are many, and amongst others the following may be quoted:—

1. Knowledge becomes full and complete.
2. Knowledge is gained with least expenditure of effort.
3. Knowledge is retained more permanently, and when needed again is recovered more readily than when received in the shape of information from a text-book. This is the more important when it is remembered that the after efforts of imagination, conception, and reasoning, depend for value mainly upon the accuracy and fulness of our observed knowledge.
4. The attention of the learner is stimulated during the effort of observation, and in time the *habit* of close attention is formed.
5. The exercise of the various organs of sense, especially of the eye in seeing, and of the hand in skilful muscular movements, results in the development of power in each sense organ. In this way sense training may be carried to a considerable degree of perfection. The knowledge gained through the senses thus trained, becomes of high value for other and higher intellectual effort.

Professor Huxley says:—'If scientific training is to yield the most eminent results, it must be *practical*, that is to say, in explaining to a child the general phenomena of nature you must, as far as possible, give reality to your teaching by object lessons. In teaching him botany, he must handle the plants and dissect the flowers for himself; in teaching him physics and chemistry, you must not be solicitous to fill him with information, but you must be careful that what he learns he knows of his own knowledge. Do not be satisfied with telling him that a magnet attracts iron. Let him see that it does; let him feel the pull of the one upon the other for himself. He should not merely be told a thing, but made to see, by the use of his own intellect and ability, that the thing is so, and not otherwise. The great peculiarity of scientific training—that in virtue of which it cannot be replaced by any other discipline whatever—is this bringing of the mind directly into contact with fact, and practising the mind in the completest form of induction, that is to say, in drawing conclusions from particular facts made known by immediate observation of nature.'

The same authority, in giving evidence before the Commission on Scientific Instruction, says:—'The great blunder our people make is that of attempting to teach from books; our schoolmasters have largely been taught from books and nothing but books. The consequence is that when they attempt to deal with scientific teaching they make nothing of it. If you are setting to work to teach a child science, you must teach it through its eyes, and its hands, and its senses.'*

* The true method of science teaching is fully discussed in Dr. Payne's Works, Vol. I.

Statement and Reasoning.—A pupil can generally be taught to state readily whatever he is well acquainted with. Expression is ready and natural because knowledge is certain and full. This accompaniment of statement with full knowledge must be always recognised in our teaching. In all science teaching it is of the first importance that our pupils should have something to see, but next in importance to seeing is the statement in the learner's own words of what he sees. This statement on the part of the scholar secures the following effects, viz.:—

i. The condition of the learner's knowledge becomes known to the teacher, who is then able to accept if correct, to correct if faulty, to illustrate where needed, to repeat where required, and by any or all of these devices to enable his pupils to secure knowledge by an exercise of thought on their own part.*

ii. The knowledge acquired being associated (through the effort of statement) with language, it becomes (*a*) more permanently retained, (*b*) more completely associated with knowledge previously acquired, and (*c*) more readily reproduced.

iii. A power of expression is secured which will be of great service when the scholar is called upon to use his knowledge.

In addition to oral statement, the pupil should be encouraged *to draw* what is seen. The drawing is more effective in revealing the exact condition of the learner's knowledge than the oral statement, and as a means of making use of the knowledge gained, especially when this is being applied in the industrial arts, the drawing supersedes all other forms of presentation.

Reasoning.—Whilst it is of very great importance that our scholars should be trained to careful observation and further to state correctly what they perceive, it is equally necessary (as soon as sufficient observed knowledge has been accumulated) that they should be exercised in combining the particular knowledge they possess into the more general knowledge termed *principles* or *laws*.

The upward movement, from the consideration of particular cases, examples and truths, to the establishment of a general truth, law, or principle, is termed '*inductive reasoning*.' The downward movement by which a general law is applied in explanation of a particular event or example is termed '*deductive reasoning*.'

* Bishop Temple, quoted by Dr. Payne, says:—'All the best cultivation of a child's mind is obtained by the child's own exertion, and the master's success may be measured by the degree in which he can bring his scholars to make such exertions absolutely without aid.'

If for example a piece of wood, a cork, and a feather be thrown into water, they are seen to float, and the observer is justified in coming to the conclusion that '*all light bodies float upon water.*'

After further experiment with a stone, a piece of iron, and a piece of lead, another truth becomes manifest, viz., that '*heavy bodies sink in water.*' If these experiments be still further extended, a substance may be found that just remains suspended in the water, and upon comparing its weight with that of an equal bulk of water, they are found to be of exactly the same weight or density. The observer now arrives at a more general truth or principle than any of those first announced. It is stated in some such form as the following :—A substance of the same weight as its own bulk of water remains immersed in water wherever it is placed ; it neither floats on the surface nor sinks to the bottom. Further, a substance which is lighter than an equal bulk of water, floats, leaving just as much of its bulk in water as displaces the water which is equal to its own weight; and lastly, that a substance sinks in water when it is heavier than its own bulk of the water in which it is placed.

These truths are arrived at by examining individual facts and by experiment, and hence the reasoning is *inductive.* When a fresh substance is submitted for investigation, and the question is asked, Will it float, or sink ? an answer is obtained by applying the general law established above. If lighter than its own bulk of water it will float; if, on the other hand, it is heavier, then it will sink. These two conclusions are not arrived at by the method of experiment, but by a process of reasoning—the general truths already established have been applied in each case, and hence the results have been obtained by '*deductive reasoning.*'

SPECIMEN SCHEMES OF SCIENCE LESSONS ARRANGED IN LOGICAL SERIES.*

Introduction.—In order that full advantage may be derived from any course of lessons in science it is necessary that such lessons should be given mainly by experiment and illustration, and that the entire course should be mapped out in a carefully-graduated and logically-arranged series. The sciences which demand the regular sequence of a series of lessons are of especial advantage for the higher intellectual training which they afford. The following are suggested series of lessons in the subjects of *sound*, *light*, and *electricity*, respectively. The schemes of lessons are followed by specimens of teaching.

* These schemes of lessons have been worked out by Messrs. Brook and Elderkin, the head masters of the Westminster Practising Schools, and are inserted by their permission.

SCHEME OF LESSONS ON SOUND.

A. Sound Medium.

1. Sound cannot pass through a vacuum. Experiment with air-pump and bell. **A medium needed.**
2. Air not the only medium. Experiment with long wire scratched at one end, also with a pole. Refer to wire fencing; savages plunge their heads under water to hear if the enemy's boats are approaching; hence water conveys sound. A watch in the mouth is heard ticking; the audiphone.

B. How Sound travels.

1. Place boys in different parts of room, up in gallery, on floor; fire a small pistol; every boy hears it. Sound passes in every direction.
2. Analysis of sound waves. As a preliminary make a chain of boys. Let them dress; push end boy; wave travels out, not the boys. Each boy moves through a certain space. Let one wave follow another.
3. Take for illustration water waves. These move in one plane, not spherically.
4. Show by drawing, the meaning of condensation and rarefaction.

C. Rate of Movement.

1. Refer to the firing of a cannon. Sound heard long after the flash is seen. Light travels practically instantaneously. Sound travels 1090 feet per second at freezing point. Increase is two feet per degree rise in temperature by the Centigrade thermometer. Give exercises to find velocity and temperature.

D. Reflection of sound—*echoes.*

1. Refer to an empty room, speech seems louder than when furnished. Sound reflected from walls; refer also to an arch or tunnel. These reflect sounds; in mountain regions a sound is multiplied; bodies reflect sound.

Tap on a slate once, twice, thrice per second. Show by experiment that when the taps reach seven they can hardly be distinguished. Nine the limit. The ear cannot separate them. Compare with spokes of a wheel moving rapidly.

2. Show by the nine syllables per second and velocity of sound why no echo in a small room, and why an echo in a large hall. In one case the reflected sound comes too rapidly on the ear. It comes in less than $\frac{1}{9}$ of a second, hence no echo. In the other sound takes longer to go to the wall and back again, *i.e.*, more than $\frac{1}{9}$ of a second; hence an echo.
3. Refer to Swiss mountain echoes and their multiplication, and the whispering gallery of St. Paul's.

E. Musical sounds.

Strike a large tuning fork, while vibrating put the prong on the surface of a little mercury. Invert a bell jar; fill with water and strike gently; take tumbler and fill nearly with water; wet the finger and rub the upper margin. Let boys see the water vibrating;

vibration of monochord string. Introduce Chladni's plate, with sand. All these show too that when a boy gives out a musical note something within his throat and the air without are in a state of vibration.

F. Sounding boards.

1. Show connection of vibration and air waves.
2. Vibrate a string without a sound board, strike a fork and let it vibrate without the sound box; now place both over sound boards.
3. Let boys note the use of sound boards in pianos, violins, etc.

G. Pitch of different Notes.

1. Make a long reed out of a lath. Screw to a table or clamp. Have laths of different lengths. Show rate of vibration. Take a harmonium and show the set of reeds. Analyse a concertina. Show reed of clarionet.
2. Show string vibrations on a large scale with rope stretched across room. Produce nodes. Show monochord, and place riders on nodes and ventral segments.
3. Stretch strings with different weights, and thus illustrate law.
4. Show properties of thick and thin strings of metal and catgut, &c.

H. Musical Instruments.

(*a*) *Made with Strings.*

1. Take violin and refer to sound-board. Show effects of tightening strings. Refer to different thickness of strings and the difference in pitch.
2. Refer also to harp, piano, guitar, &c., as stringed instruments. Note the differences in length and thickness of strings.

(*b*) *Made with Pipes.*

1. Hold a fork over a large boiling tube, being partially filled with water. Show that at a certain point the fork is heard with distinctness. The column of air is then vibrating in resonance.
2. Explain structure of a tin whistle and use of air column.

I. Nodes and Beats.

1. Show organ pipe and explain its structure. Show open pipe and stopped pipe.
2. Show the use of the holes in flute and whistle.
3. Explain the production of nodes in a string; also in organ pipe. Modes of showing these latter.
4. Blow into organ pipes of slightly different pitch. Let children notice unpleasant sound. Play on harmonium, on two keys of low and of almost the same pitch.
5. Draw diagram on the board of two sets of waves, say three and four inches apart, and show the coincidence at every twelve inches; show the connection with beats.

6. Permit boys to produce the notes of the scale on a monochord, and trace out one or two of the simple relations, as *doh*, and lower and upper *soh*; give the ratios of vibrations.
7. Refer to discord and harmony; give examples on harmonium, and distinguish between music and noise.

LESSONS IN THE LIGHT COURSE.

A. Source.

1. The sun and artificial lights.
2. Chemical.—Experiment with chlorate of potash, sugar, and H_2SO_4.
3. Physical.—Striking a match; exploding a cap.

B. Propagation.

Elementary notions of wave motion obtained by illustrations.

Law of intensity illustrated by cardboard and rod. Illustrate by the analogy of bread and butter—the thinner the butter the more area a given amount will cover.

C. Shadows.

1. Show variously shaped bodies, such as sphere, hexagon, square card, and get varieties of shadows.
2. Photometry.—Have a darkened room, candles large and small, gas, magnesium wire stand.
3. Eclipses.—Umbra and Penumbra.

D. Reflection.

1. Throw ball against a wall in various ways. Illustrate by mirror, string, and rod.
2. Plane mirror, gallery of reflexion, 2 mirrors.
3. The so-called seeing through a brick.
4. Plane mirrors at an angle, and the calculation of the number of images.
5. Kaleidoscope, its structure and principles.

E. Curved mirrors.

(*a*) *Light from a point.*—**Concave mirror :—**

1. From infinite distances.
2. At centre of curvature.
3. At principal focus.
4. Between principal focus and centre of curvature.
5. Between principal focus and the mirror.

(*b*) *Objects.*—As above with objects.

Convex mirror.—Only one case.

F. Refraction Experiments.

1. Stick in water.
2. Coin brought into view.
3. Apparent depth of water and real depth.
4. Illustration of refraction. A group of boys marching obliquely across the floor meeting with desks.

G. A prism. Its structure.

Two prisms forming a convex lens, also a concave lens.

H. Lenses.

(*a*) Convex { *1st points* as above for concave mirrors. *2nd objects* as above for concave mirrors.

(*b*) Concave *3rd concave lenses* as above for convex mirrors.

I. The eye, its structure—model to be shown.

Spectacles for long and short sight.

J. Reflection and refraction.

Twilight; mirage, multiplication of images in one mirror, scattering of light, damp towel, broken glass, a cloud—its body and edges.

K. Optical instruments.

1. *Microscope*, for very near distances. Object between principal focus and lens.
2. *Magic lantern*, object near to the principal focus.
3. *Camera*, object beyond principal focus.
4. *Telescope*, object at a great distance.

L. Dispersion of light.

Prism and slit. Rainbow.

SCHEME OF LESSONS IN ELECTRICITY.

(SPECIFIC SUBJECT.)

Lessons in Logical Sequence.	Apparatus required in each lesson.
1. Sealing wax rubbed with flannel, and a glass rod rubbed with silk, attract light bodies.	1. (*a*) Sealing wax and flannel pad. (*b*) Glass rod and silk pad. (*c*) Small pieces of paper, bran, Dutch metal, and feathers.
2. Proof that there are two electricities.	2. Same as in last lesson, together with means for suspending or balancing the rods.
3. Like electricities repel, and unlike attract.	3. Same as No. 2, with the addition of an ebonite rod.
4. Induction.	4. (*a*) Glass, sealing wax, rod and rubber. (*b*) Lath and insulator, small pieces of paper, or bran. (*c*) Umbrella or body which can be suspended.
5. Balls, potatoes, or eggs may be charged inductively. (*Contrast this with magnetism.*)	5. Rods and rubbers, with objects named, and insulators; connecting wire.

Lessons in Logical Sequence.	Apparatus required in each lesson.
6. Electroscope. (*Construction.*)	6. See lessons on the electroscope.
7. Why gold leaves expand when an excited body is brought near the cap.	7. Same as 6, together with lath, insulator, and two pith balls.
8. How to charge an electroscope, negatively, and positively, by induction.	8. Electroscope, with rods and rubbers lath and insulator.
9. Uses of electroscope. (1) To test for electricity. (2) To test for kind of electricity in any body.	9. Same as 8. **Home made.**
10. The electrophorus.	10. (*a*) A sheet of tin. (*b*) A plate of ebonite or a mixture of shellac and sealing wax melted into a small tin plate. (*c*) A round piece of cardboard and tin to cover it. (*d*) Short length of glass tubing, with a cork in one end; and also a drawing pin.
11. Use of electrophorus and the mode of charging it.	11. Same as 10.
12. Electrical machines, and explanation of action.	12. How to make one.
13. Condensers.	13. Two circular pieces of cardboard with insulators, a sheet of glass, and two pith balls on stand; sheet of glass, with tin-foil pasted on each side.
	Home made.
14. The Leyden jar.	14. (*a*) Bottle, and a nail inserted through cork. (*b*) Bottle, iron filings, and a nail in cork. (*c*) Plain tumbler, fitted with cardboard lining inside and outside stopper, rod, and chain.
15. To charge and discharge Leyden jar, and uses thereof.	15. Discharging tongs.
16. Action of points.	16. Candle; pointed rod to fix on electrical machine. Long needle; *electrical whirl.*
17. Thunder and lightning; lightning conductors, construction and uses.	17. Leyden jar and dischargers.

ECLIPSES OF THE MOON.

(A LESSON ON SHADOWS.)

Information arranged under Headings.

A. Shadows. (Simple experiments.)

1. The shadow of a sphere is circular in shape, and if the light comes from a point, the circumference of the shadow is larger than the circumference of the ball.

   The screen receiving the shadow must be held perpendicularly to the direction of the shadow in all these experiments.

   The effect of turning the screen round, upon the shape of the shadow, may be observed by the scholars, and they should be encouraged to state what they see.

2. If the ball is smaller than the luminous object (as, for instance, in the case of the lamp and ball in fig. 2), the circumference of the shadow is smaller than the circumference of the ball. The further the screen is removed, the smaller the shadow becomes.

3. A second shadow, less dark than the first, may frequently be detected surrounding the dark inner shadow.

   The room must be darkened in order to show half shades to a class.

   The dark inner shadow is termed the **umbra**, the surrounding and lighter shade is termed the **penumbra.**

B. Application of the above truths in explanation of the phenomena of lunar eclipses.

1. When the earth and moon are in a direct line with the sun, and the moon is on the side of the earth opposite the sun, **the moon enters the shadow of the earth and becomes eclipsed.**

   In fig. 3, E represents the earth with umbra and penumbra.
   M 1 represents the moon approaching the earth's shadow.
   M 2 represents the moon eclipsed.

2. The moon can only be in the position described in paragraph 1 when it is **full moon**, or when it is in **opposition.**

3. Hence an eclipse of the moon can occur only when the moon is at, or near, **full moon.**

   Whilst this is true and not difficult to understand, we know from frequent observation that the moon is not always eclipsed when it is **full**, *i.e.*, every month. The reason of this is difficult to state and can only be understood by **the aid of diagrams and models.**

   The following paragraphs present an explanation by means of statement and diagrammatic illustration.

Illustrations, Teaching Hints, &c.

A. Fig. 1. S is a circular and enlarged shadow on the screen AB.
LP is the position of the light.
SP is a sphere or ball whose shadow alls on AB.

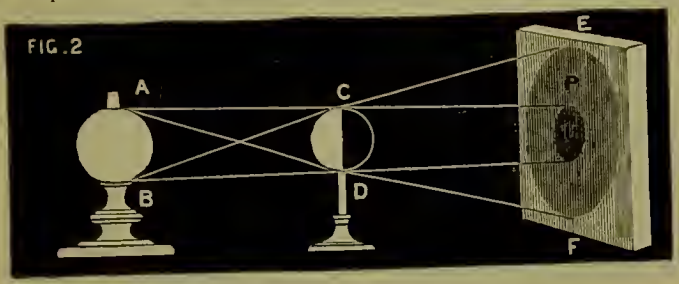
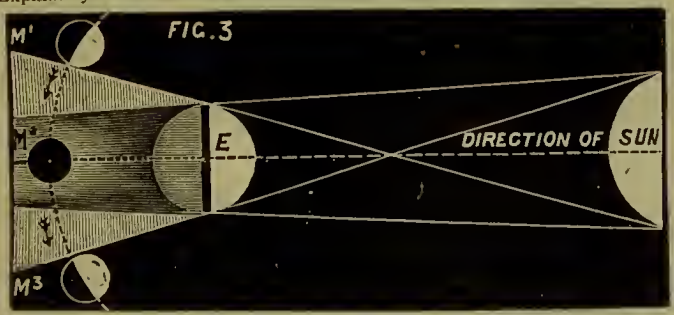


Fig. 2. The umbra is represented by the dark circular shade.

2 Show this experiment, and mark the limits of the umbra on the screen. Then, by diagram, illustrate its formation by drawing AC and BD continued to the screen EF. Change the position of the screen EF; the umbra will be larger or smaller as the screen is moved towards or away from the sphere CD.

3 Explain by similar methods the position and size of the penumbra.



B. Fig. 3. A model constructed in the following way will be very helpful at this stage :—

Take a ball to represent the earth. A cone of black paper may be fitted on to the ball so as to cover the dark half. Let this cone extend some distance in the direction of M_2, so as to represent the 'cone of shade.' A small ball should be slowly moved across the end of the paper cone : it will illustrate at different points of this movement both partial and total eclipse of the moon.

Refer to an almanac for the year and compare the times when eclipses of the moon are expected to occur with the *phase* which the moon will be in at the same time. In this way the connection between eclipse and full moon will be established.

C. Why is there not an eclipse of the moon every month, viz., at every full moon?

In reply :—

1. The moon moves round the earth in an orbit whose plane is inclined about 5° to the plane of the earth's orbital movement round the sun.

   Particular attention must be directed to the moon's position when crossing the second plane, and also when furthest away from this plane, *i.e.*, at C and X respectively, fig. 4.

2. The moon is represented 'in opposition, or full, in fig. A, diagram 5, but is not eclipsed because the moon is a considerable distance above the earth's shadow.

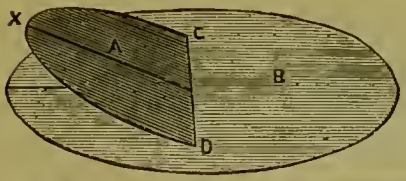
3. The moon is represented 'in opposition,' or full, in fig. B, and in this case it is eclipsed. Why? Because it is not only full moon, it is at the same time at, or near, the point where the moon's orbit crosses the plane of the earth's orbit.

   The earth's shadow always stretches away from the sphere with its axis in the plane of the earth's orbit. Hence, when the moon at full happens to be near the earth's orbital plane it passes into the earth's shadow and is eclipsed.

4. The crossing points of the two planes which the moon must pass every month, are termed **nodes.** When, therefore, **the moon is 'full' and at or near its nodes it will be eclipsed.**

Summary—

1. The shadow of a ball or globe is circular when cast on a screen held vertically to its direction.
2. The size of the shadow depends upon
   (*a*) The size of the luminous object.
   (*b*) The distance of the screen from the object casting the shadow.
3. When the luminous object is larger than a point **a penumbra surrounds the umbra.**
4. An eclipse of the moon can occur only **at or near full moon.**
5. The reason of this :—
   (*a*) The moon's orbit is inclined 5° to the earth's orbit.
   (*b*) The shadow of the earth is cast **in the direction of its own orbit.**
   (*c*) The moon can enter this shadow only when
   (1) in opposition or 'full'; (2) when crossing the earth's orbit.
6. The moon is not eclipsed every 'full moon' because often it is full and **either above or below the earth's shadow.**
7. The moon is always eclipsed when it ulfils the two following conditions :—
   1. It is **full moon.**
   2. At, or near, its **'nodes.**



C. 1. Fig. 4. Diagram showing A, the upper half of one plane, cutting a second plane B along the line CD.

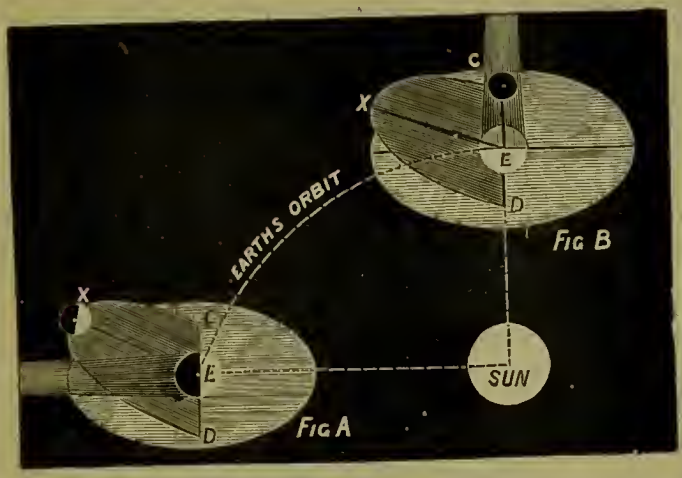


Fig. 5.

2. Fig. A. Shows the conditions in which the moon, though *full*, is not brought into contact with the earth's cone of shade.

3. Fig. B. Exhibits the moon at full, at that part of its orbit most favourable for an eclipse.

4. A model of a very simple kind is very helpful at this stage. It is made as follows :—

Take a sheet of cardboard to represent the earth's orbital plane, mark on it the position of the earth's orbit. Then at the positions occupied by figures A and B insert differently coloured cardboard planes to represent the moon's orbit. With balls to represent the position of the sun and that of the earth, and a movable ball to represent the moon firstly as in fig. B and secondly as in fig. A, there will be very little difficulty in realizing the conditions favourable for a lunar eclipse.

Questions for Examination.

1. Experiment with the shadow of a plate and a ball. State any differences you observe in the results.
2. When is the shadow larger than the object casting it?
3. Show by the aid of a diagram the formation of a 'penumbra' and an 'umbra.'
4. What must be the astronomical position of the moon in order to be eclipsed?
5. At what angle is the moon's orbit inclined to that of the earth?
6. Draw a diagram showing the moon in opposition and eclipsed.
7. Draw a second diagram to show the moon in opposition, or 'full,' and not eclipsed.
8. State the two conditions which must be fulfilled for the moon to be eclipsed.
9. How often during the course of a year is the moon in a position favourable for an 'eclipse of the moon'?

THE PLACE OF LANGUAGE IN TEACHING.

Introduction.—It was stated in the opening chapters of this book that to secure the highest intellectual attainment the scholar needs to be brought into living contact with a teacher. This living contact is brought about mainly by means of language. By his language the teacher communicates information whilst he stimulates his pupils to effort in sympathy with his own, and by his speech the scholar makes clear that thought has been awakened, and that knowledge has been acquired. The importance of language in the work of teaching becomes very evident if we consider how very little could be accomplished without it. In the following chapter it is intended to set forth, in brief outline, a simple statement of the use and the value of language at each stage of intellectual progress.

Language and Observation.

If we watch a child in the midst of novel surroundings its repeated enquiry is, 'What is this?' 'What is that?' Any new thing, or any new feature in a more or less familiar thing, stimulates the enquiry of the child. We satisfy this natural craving immediately we associate a name with the new impression. What is there in the child's nature prompting this enquiry, and how is it that the child appears to be satisfied whenever the teacher or parent supplies a word or words? Is not the solution of the latter problem to be found in the fact that the child wishes to preserve the newly-found knowledge? Does not the child, so soon as it meets with its companions in the home, appear to delight in telling them all the novelties it has seen? Evidently the word or words it asked for enables the child both to retain and to display its knowledge.

The child, furthermore, by its ability to bring up past impressions at the suggestion of words is enabled to compare these revived impressions with the new impression it afterwards receives, and in this way it is enabled to extend its stores of knowledge. For example, we suppose a child has recognised the quality of 'transparency' in the window pane. As soon as it looks into a shallow pool of clear water, it is able at once to state something about the water. If asked, the child will say 'the water is transparent.'

The knowledge previously obtained direct and from observation in connection with the pane of glass has been embodied, as it were, in the word 'transparent.' The child recognises the recurrence of the quality in the clear water and does not hesitate to affirm of water that it also is transparent. This use of the word in a fresh connection is complete evidence of the correctness of the notion previously obtained in association with glass, it is also proof that the impression then made has been retained, and, furthermore, the acceptance by others—its teachers, companions, &c.—of the child's new use of the term is satisfactory and encouraging evidence to the child of the correctness of its present act of observation.

Some words are very closely allied to the qualities or actions they name, *e.g.*, hiss, hum, buzz, thud, &c. But the greater portion of our words are not thus suggestive of the things they symbolise. When once, however, a word has been clearly associated with a thing or an action it is capable of readily bringing the impression made by that thing or action to our remembrance.

Observation and the need for an increased vocabulary.

Observation enables us to increase the knowledge we have of surrounding objects. Our stock of words tends also to increase with our knowledge. The word *house* is first applied to the structure in which the child lives. This word is soon, however, applied to the structure next door, and the one on the opposite side of the street. In order to distinguish between the different structures resembling its own home, the child uses such words as small, large, thatched, brick, and stone. Should the observed object be one possessing activity, then all its movements become centres of the child's attention. For example, the child observes of the dog that it barks, runs, bites, &c.; of the cat that it plays, mews, scratches, &c. These words become readily associated with the familiar actions of the domestic animals named. In this way, words descriptive of *things*, of *qualities*, and of *actions* are acquired.

This is not the place to discuss whether the noun or the verb is first needed by the child. Our scholars have become familiar with simple forms of speech before they enter school. The initial stage is taken out of our hands. We can do much, however, in our lesson exercises to increase the store of language already possessed by our pupils, and we should lose no opportunity for encouraging our scholars to make use in both oral and written form of the new words they acquire.

Language stimulates intellectual effort.

Children are brought up in the midst of others older than themselves and of fuller knowledge. They hear words used in the home and in the school which at first they are unable fully to understand. This language becomes a stimulating influence over the child, especially when the language is not too difficult. The learner strives to reach the level of

knowledge indicated by the words used. The questions a child sometimes ventures to put to its parents and teachers reveal the struggle after knowledge which is working in the child's mind, and the attempt to use language somewhat in advance of its own knowledge marks the child's ambition to reach the level of its superiors. The fulness of the language used in the home and the school has its effect upon the child's mind, stimulating it much in the same way as the language of a nation stimulates to intellectual effort all who listen to, or who use it.

The introduction of new words in school lessons.

The reading lesson sometimes introduces new words. This is right so long as the new words are not too numerous. A reading book crowded with unfamiliar words is a positive hindrance to the practice of good reading. The context often throws light upon the meaning of new words in a reading lesson. When this is not the case the teacher must explain. Children should be encouraged in the use of the words they hear or read. On no account should such early use of new words be met by ridicule. The gradual approximation to the correct use of the language they either hear or read is one of the most certain indications of a growing intelligence.

There are some words which should be used with precision and accuracy from the first. Such words, for example, as are descriptive of the gifts and occupations of the infants' school. Words introduced to name objects and qualities of objects in elementary science and grammatical terms belong to this class. It is in this sense that the maxim 'ideas before words' must be understood.

Language and Memory.

As we proceed higher up the scale of intellectual activity the greater become the need and the value of language. Most of our mental images are stored in association with, and are reproduced at the suggestion of words. It is true that there are other associations by means of which impressions (mental images) are suggested. For example, the sight of a familiar face suggests a name, the last time the same face was seen, and the place. For one such suggestion by contact with actual objects, however, we have very many mental images called to remembrance by the use of words.

The power of verbal association is one of the most valuable that the human intellect possesses. A good verbal memory generally marks out a more than ordinarily robust intellect. There are instances, however, where the power to retain and to retail words in parrot fashion becomes a positive hindrance to the growth of the higher and nobler powers. A learner with a good verbal memory may be able to repeat all the propositions in Euclid without gaining any of the training of the reasoning powers which the study is intended to provide. A youth may learn every canto in Scott's 'Lady of the Lake' without having his imagination aroused so as to clothe the dead symbols with warmth and colour and life.

Language and Imagination.

When the scholar proceeds to elaborate out of the mental images stored by memory those new images which are beyond actual experience, the value of language, both written and spoken, becomes most evident. Reference was made in a previous paragraph to the power we possess of taking the language used by Scott in his 'Lady of the Lake' and of clothing the words of the poet with warm living reality. The value of this imaginative effort in the acquisition of knowledge may be readily put to the test. Let the lover of Scott—someone with a good store of images of natural scenery, a wide knowledge of border life and of historical events, let him visit for the first time the scenes described by the poet. He will be struck with the familiarity he manifests with scene after scene he visits. The very words of Scott will be constantly recalled as each new view is disclosed, showing that the visitor recognises the picture which the words symbolise. The correctness of his former interpretation of Scott, attested as it is now by the striking likeness existing between his mental pictures and the actual scenes, will afford both surprise and delight. In the same way (*i.e.*, by language interpreted by an active and widely supplied imagination), a reader is put into possession of the entire realm of historical knowledge, all the beauties of poetry and the vast storehouse of travel and adventure.

Practical Suggestions.

It should here be noted—(1) That the possession of a wide literature supplies the material upon which an active and well-developed imagination may be constructed. (2) That the more readers our various educational efforts produce, the greater becomes the area of imaginative activity. (3) That the multiplication of reading books in schools becomes a direct gain so long as we are content with a general appreciation of the matter read, and do not absorb too much effort upon either the spelling difficulties of the words or the grammatical structure of the sentences.

> If we would cultivate a taste for reading we need to throw aside all thought of an examination upon the subject; we must stimulate the learner to go through the processes of imagination and of thought which the matter suggests; and we must strive to bring the learner under the spell which the beauty and symmetry of the entire work is capable of casting round the reader.

Professor Sully, speaking of the exercise of the imagination by means of reading, says, in his *Teacher's Handbook*:—'Descriptions and narrations should increase in length and intricacy by gradual steps. The first exercises of the imagination should be by means of short telling narrations

of interesting incidents in animal and child life. Such stories deal in experiences which are thoroughly intelligible and interesting to the child. The best of the traditional stories, as that of Cinderella, are well fitted by their simplicity as well as by their romantic and adventurous character to please and engross the imagination. And fables in which the moral element is not made too prominent and depressing, and in which the child's characteristic feelings, *e.g.*, his love of fun, are allowed a certain scope, will commonly be reckoned among his favourites. As the feeling of curiosity unfolds and the imaginative faculty gains strength by exercise, more elaborate and less exciting stories may be introduced.'

In addition to the practical conclusions enumerated above the following may now be stated :—

4. That instruction in all matters beyond the region of simple experience becomes possible mainly so far as language is used by the teacher and is understood by the pupil, *i.e.*, we instruct so far as our pupils make use of language.*
5. That the language we use should in the main be familiar, so that the child may have the greater part of its intellectual activity available for imaginative effort.*
6. That questioning becomes of great value at this stage inasmuch as it serves to recall and refresh the knowledge previously acquired ; it also stimulates the child to embody new acquisitions in appropriate language; and finally it serves to clear of error both the recalled knowledge and the acquired matter.

Language and the various operations of Thought.

It has already been stated that the association of names with mental images tends to render the latter permanent and readily recoverable (*memory activity*). It has further been shown that language is of vast importance in the effort of regrouping the images which memory presents (*imagination*). It remains to assert, and as far as possible to explain, that the higher operations of intellect, viz., those of thought, including conception, judgment, and reasoning, become possible only so far as they are associated with language.† It has already been shown, pages 50—54, that general or class names like *book*, *plant*, *metal*, &c., become fully understood only after many individuals of each group have been made the subjects of comparison and abstraction. The process of naming completes

* If the context be very helpful to the meaning of a strange word we may use the word as a stimulus to effort on the part of the pupil.

† 'No animal thinks, and no animal speaks, except man. Language and thought are inseparable. Words without thought are dead sounds; thoughts without words are nothing. To think is to speak low; to speak is to think aloud. The word is the thought incarnate.' *Science of Language—Max Müller.*

the above intellectual operations. The name is meaningless without the intellectual operations, and the intellectual operations are fruitless without the name.

> The close connection between the naming and conceiving will become evident if we look at a simple example—if, for instance, we select the general notion associated with the term 'book.' The class or general notion, when once formed, enables us mentally to collect under it a great number of objects, it is true; but if we were to attempt to concrete the general notion embodied in the term by making an object representation of it, the effort would fail simply because we should be obliged to introduce features such as paper, parchment, bound or unbound, &c., which features are not common to the class; we should in fact produce an individual belonging to the class instead of a perfect representation of the class notion. The class notion under which we mentally bring our group of objects by an act of generalization is a mental creation whose outward symbol is the name.

The twofold meaning of general terms in relation to abstraction and generalization.

The double operation of abstraction and generalization in the formation of the concept is closely allied to the double meaning which all *general* terms possess. The effect of comparing several individual members of a group of allied objects results at first in the recognition of striking peculiarities; these are dismissed from the account, as it were, in order that the attention may be fixed on the common and resembling features existing between the different members of the group. These resembling constituents, *i.e.*, the common qualities in the group for which the general term is given, form the *connotation* of the term. The intellectual effort up to this stage has been that of abstraction. Besides summing up the qualities forming the connotation, a general term conveys the notion of a class of objects. *Denotation* is the name applied to the latter meaning of a general term. The intellectual operation of mentally placing all objects possessing the qualities connoted into the same class is Generalization. We may say of all general terms like *house*, *book*, &c., that they denote *objects* and connote *qualities*, *e.g.*, the term book connotes the qualities of *possessing leaves bound together*, at the same time it denotes *dictionaries*, *histories*, *novels*, &c. We may further state that the connotation of a concrete general term is arrived at by a process of abstraction and that its denotation involves an effort of generalization.

It should be noticed that the terms connotation and denotation are used in connection with *general* terms. If an *abstract* term like wisdom be introduced, it will be evident that there can be no denotation. As there are only qualities bound together by this abstract name, it must be solely connotative. Another aspect of terms which should be noticed is that in a series of general terms, like Book, History-book, and English-history-book, the denotation narrows as the connotation widens. In a *singular* term like St. Paul's, or William the Conqueror, the denotation is reduced to one object, whilst the connotation includes all the characteristics of the individual.*

* A careful study of the different classes of terms and their relation to one another will prove of great service in teaching. See Jevons' *Lessons in Logic*.

How children learn to use general names, &c.

The correct use of general terms like *island*, *noun*, *house*, *tree*, &c., is arrived at by two different methods :—

1. The Inductive or Discovery method may be followed. Suppose, *e.g.*, the meaning and use of the term 'island' is to be taught. The class has already a knowledge of terms like sea, mainland, coast, peninsula, and promontory. These in turn are brought under review by means of model and map. Upon introducing a model of the southern coast-line of Hampshire, and the adjacent land separated from it by Spithead and the Solent, the essential difference between the peninsulas on the Hampshire coast and the island will readily be noted. The former are *almost* surrounded by the sea, the latter is *entirely* surrounded. A map of England is introduced and the class is asked to point to other areas of land similarly surrounded. Ireland, Anglesea, Lundy, and the Scilly group are indicated. The name *island* is now supplied and the class asked to state what an island is. They will readily leave out of their statement all references to size, shape, &c., and will fix their thought on the one resembling feature which runs through every example, and state that 'An island is land surrounded by water' (connotation), as, *e.g.*, Ireland, Anglesea, Jersey, Alderney, &c. (denotation).

A lesson in Grammar (on the noun, for example) would follow much the same plan, *i.e.*, it would proceed from particular examples to general notions and the general terms which symbolise these notions.

The general terms of Geography and Grammar, and the technical terms of Science, and many new terms met with in the reading lesson, admit of this mode of treatment. The general term in each of these cases should be supplied when the notion has been imparted and not before. In the same way the laws of Grammar, the rules of Arithmetic, and the principles of Science may be taught—the ideas being acquired by the effort of the learner under the direction of the teacher, and acquired furthermore before the term or truth is stated. In the above examples the teaching should result in a full knowledge of the meaning of the word introduced, together with the power to use each new word as soon as it is acquired.

2. As an example of the second method of acquiring the meaning of general terms, we may suppose the general term 'house' to occur in a reading lesson. The class is asked to state its meaning. One child, thinking of its home, answers that 'a house is the building in which its parents and brothers and sisters live'; another child, with fuller knowledge and greater power of abstraction, says 'any building in which people live.' So far the replies are based upon the child's knowledge of examples within its own experience, and the method is Inductive. The teacher, however, in order to obtain a more correct answer suggests that any building which affords regular shelter is a house, that the structures, *e.g.*, occupied by the fowls and the coach are termed houses, and further that these may be made of wood or of iron. The question is again put. The two ideas, viz., *a structure*, and *for occupation*, are seen to be common to the whole of the examples. The notion has gradually enlarged from the individual house, *i.e.*, the child's home, with its wide connotation and narrow denotation, to

a general notion having but two qualities, and hence of narrow connotation, but covering most if not all objects included in the term and hence of wide denotation. The teaching by which the child's notion has been perfected, *i.e.*, the teaching by means of definition and the supply of explanatory examples, is distinguished as the Dogmatic, the Deductive, and the Telling Method.

The child's first answer revealed a vague or indefinite notion of the true meaning of the general term. This became clear after the definition of the term 'house' together with other examples had been supplied by the teacher. This method is the one by which children acquire many of their general notions of common things. It is an example of proceeding from the indefinite to the definite. The Dogmatic Method is employed whenever, in teaching, we begin with terms and definitions, and proceed to illustrate their meanings by examples. It should be noticed that the names *Telling* and *Dogmatic* are only perfectly applicable to this method when the term or truth to be taught is entirely new.

We may evidently teach the meaning of general terms (1) by the inductive method; (2) by the deductive method, and (3) by a mixture of the deductive and the inductive methods. Whichever method we select there is clearly but one fundamental condition of sound acquisition running through all, viz., that we base all teaching of general notions, of definitions, of rules, and of principles on a plentiful supply of carefully selected examples.

The value of complete statements in all exercises of Judgment and Reasoning.

It is stated on pages 58 and 65 that so far as intellectual effort is concerned there is no new form of activity in the further exercises which logicians have termed *judgment* and *reasoning*. Our *general notions* are formed, as we have just seen, after comparison of many individual cases; our *judgments* are the result of a comparison between two ideas or notions, as, *e.g.*, silver is white; and our *inferences* are the result of a comparison between judgments already established and others which we form from them. 'Formally considered, reasoning is passing from certain judgments to other judgments. Thus before a boy can explicitly argue that a particular substance will float in water he must have already judged that all substances of a certain order (*e.g.*, those lighter than water) will do so.'* Having thus briefly recalled the close relationship there is existing between the several processes of thought, we may pass on to notice the position which the language of the school holds in each of these higher operations. We shall perhaps do this best by trying to realise the value of the effort of the child to express itself in complete statements. If any complete statement be examined it will be seen that there is an act of thought underlying it. Such expressions as 'King Richard was a brave warrior,' 'The word *write* is a verb,' 'York is a city,' and 'Wisdom is a

*Prof. Sully.

virtue,' are in each case the result of an exercise of thought. In the first instance, we may suppose a lesson to have been given upon the chief events of King Richard's reign. The statement made by the child is the result of bringing the events of Richard's life into comparison with its notion of a brave warrior. From this comparison an agreement is seen to exist, and this recognised agreement (established by an act of judgment) is expressed by the complete statement referred to. The same holds good of the remaining expressions. Children are aided in their thinking effort if they are frequently encouraged to express themselves in complete statements. The complete statement not only demands an effort of thought but it shows the teacher whether the child's thinking is sound and reliable.

The teacher sometimes helps the child over a process of thought such as that cited above by asking the question, 'What kind of king was Richard?' The child answers 'brave.' In this way *brave* and *Richard* are brought together in the child's mind, and a simple form of judgment has been exercised. It is well, when questioning of this kind is largely used, to supplement the exercise by asking children the reason for their answers. It will be found that all answers to such further questions as 'Why do you say that Richard was brave?' require the child mentally to refer to a wider truth, viz., that 'all men who do noble deeds for others are brave.' Richard did these noble deeds, therefore we say he was brave. Such full statements as these are, when made, evidence of successful reasoning effort. In oral teaching there is some danger of using the question and answer form of expression almost exclusively during exercises of reasoning. The danger lies in the fact that we may suggest so much in the question that the answer demands but little effort either of judgment or of reasoning. At times, therefore, it is well to require children to set forth the processes and results of their judgments and reasoning in complete statements.

SCHOOL MUSEUMS AND EXCURSIONS.

A PAPER READ BY J. H. COWHAM AT THE EDUCATIONAL CONGRESS IN CONNECTION WITH THE INTERNATIONAL HEALTH EXHIBITION, LONDON, 1884.

Introduction.—The acquisition of knowledge by means of a careful observation of objects as they are collected and arranged in a school cabinet, or as they may be sought during an excursion in the field, is both an attractive and an effective mental exercise. The schoolboy who is called upon to examine a specimen in botany or geology, or to perform an experiment in chemistry or physics, immediately concentrates all his thought upon the effort. He plies his teacher with questions, and is at once in the best possible state for receiving and retaining knowledge.

The educational value of the objective teaching which a carefully-selected and well-arranged museum enables a teacher to give is so great, and extends to so many particulars, that its advantages would bear a more detailed statement than I have time to make. I may, however, summarise them by saying that this objective teaching—

1. Supplies the pupil with precise information with the least expenditure of time and trouble to himself.
2. Fixes the attention, while at the same time it develops and strengthens it.
3. It yields training in careful observation, thus supplying the pupil with definite and reliable mental images.
4. The verbal description of the facts observed affords a valuable exercise in the use of exact language.
5. Lastly, the habits of observation and reflection thus acquired are subsequently available for more scientific forms of research.

Collections of Objects of Service in teaching Geography.—The advantages of possessing a classified set of objects for school instruction being so great and obvious, I now proceed to indicate a mode by which they may be obtained. In fulfilling this part of my duty, I shall limit my statements to the plan followed for obtaining objects suited to one branch of school work.

In the study of geography I have noticed that scholars find the accounts of the industries of a country, the commerce, and the lists of imports and exports, most irksome to learn. These fail to arouse interest, and hence are difficult to remember. Now, if the learner were taken over a mill, or through a factory, and there saw the material passing through its various stages of manufacture—the raw material, the sources from which it is obtained, the process of manufacture, the people engaged, the towns where they live, the finished article, and its market—all these would be noted with an awakened interest, which would render the ideas and impressions received both accurate and permanent.

In some cases children may be taken over a factory, or through an Exhibition, in which manufacturing processes are in operation. Where, however, such visits as these are impracticable, the teacher may place in his cabinet of objects the materials which sufficiently indicate the gradual change from the raw to the finished article.

Examples of Objects.*

Here on the table is a series of objects, collected for the purpose of illustrating, as far as necessary, the various stages of manufacture in connection with the chief British industries. In explanation of a few of the most important collections, I may make the following statement:—

1. *Manufacture of earthenware.* — We examine the collection of earthenware in the presence of a class of children. Their attention is first directed to the simple flint pebble—a part of the raw material which is obtained from the coast of South Devon. The stone is taken to Burslem, where it passes through the calcined and crushed stages to the slop state, as found in this bottle. Here, again, is granite in its rotten stage, as found in the basin of the Fal, in Cornwall. From this is obtained the kaolin, or China clay, now to be mixed with the flint slop. The class is slowly conducted over the remaining stages of manufacture—through the plastic clay to the thrown, the biscuit, the printed and glazed states to the baked and finished article.

   In the foregoing sketch, it will be noted that a careful selection of the essential stages has been made, and these only submitted at first for inspection. Afterwards, the remaining details are added, at short intervals. Thus, a more complete knowledge of each process is secured, and a continuity of interest maintained. The same general principles should guide us in every separate instance, and the application of these will be carefully borne in mind in subsequent illustrations.

* The objects were collected direct from various manufacturing firms. In many cases, valuable material, prepared and labelled for exhibition, was supplied, free of cost

2. *Manufacture of cotton.*—The collection of objects, representing the various stages in the manufacture of cotton goods, can easily be obtained, with the exception of the raw material in the pod. There is no market for this in England, and its supply depends upon the inclusion of stray pods in the bales of raw cotton.

I have purposely omitted from the cotton display the ordinary thread, and the various forms of plain and printed calico, for the sufficient reason that these are well known, and their addition, whilst it would not increase the knowledge of the observer, might divert the attention from those objects which the collector wishes especially to bring under review.

3. *Manufacture of silk.*—The production of raw silk may be made most interesting by allowing children to watch, from time to time, the various transformations the silkworm undergoes from egg to cocoon. A collection of silk stages may not be so necessary as those of cotton and wool, if we take into account the relative values of these British industries. The extreme beauty and delicacy of each of the silk products, however, make the collection of value as a contrast to the coarser products of cotton and wool, and they may also be made instrumental in awakening interest in other things similarly delicate and beautiful.

4. *Remaining Manufactures.*—It is not necessary to enter into a detailed account of the various collections needed to complete a review of the chief British industries. It will be sufficient simply to enumerate them. To those already mentioned, the following may be added :—Woollen goods, leather, paper, straw plaiting. English woods, veneer and veneering. Sugar refining. IRON—smelting, steel rails and wrought—knife and fork, pen, pin, and needle. COAL, with gas products ; Graphite, with the stages in the manufacture of a lead pencil ; jet and brooch-making ; petroleum and candle-making ; soap ; salt from brine to table salt ; the common ores, and the most useful building stones.

5 *Exports and Imports.* — Closely related to the manufacturing industries are the imports and exports of a country. These in text-books are tedious lists, intended to be learned by heart. Here, again, the power of retention is aided by associating samples of the objects imported or exported, with the names of the localities from whence they are obtained. In illustration of this I have taken the twenty most valuable English imports. Each of the first eight is placed in an illuminated circle, which graphically represents the relative money value of the import. Under the circle the learner reads the names of the countries supplying the article. The remaining twelve are also indicated in sample and by name, with the locality from whence obtained. These are intended for reference only, whilst the first eight, with their values and countries to which they are related, are intended to be particularly noted and remembered.

An exhaustive collection of material for illustrating either manufacturing processes or objects of commerce dependent upon them is by no means necessary. If in either direction we attempt too much, vague impressions are made, and confusion ensues. On the other hand, by limiting the display to the most important industries, with only the essential features in each, and by placing in bold relief the articles of highest commercial value, we secure impressions at once bold and striking.

The educational value of this collection of objects may now be briefly recapitulated:—

1. The senses are trained by a close and well-directed examination of each series of objects.
2. The collections are of sufficient novelty to arouse the attention and to secure vivid mental impressions. These will afterwards be readily recalled, and will form reliable material for further mental operations.
3. The gradual evolution of a definite product here exhibited in its progressive stages, culminating in each case in a finished result, can scarcely fail to direct the attention of the pupils to the finer and more subtle gradations in the works of nature, by which the most complex are ever being produced by the combination and integration of simple elements.

The need of apparatus in Physical and Astronomical Geography.

The last consideration leads me to pass from the transformations effected by human agency, to those which are constantly taking place in the works of nature around us. Here, however, the phenomena are often dependent upon operations which occur on too vast a scale, either of time or space, for the child to observe them, as, for example, the movements of the planetary bodies, or the relationship between a range of mountains and its river systems. The need of apparatus is manifest in the first case, a well-directed field excursion will be necessary in the latter. The apparatus at present available for assisting the learner to realise these grand movements in nature is very complicated and expensive. That which can be made by the teacher himself is best adapted to the purposes of instruction. Apparatus thus prepared is of great interest both to the teacher

and his class; moreover, it will be made for special ends, and all considerations not conducive to those ends will be carefully excluded. As an illustration of my meaning, I may call attention to a set of apparatus specially designed to assist children to understand such subjects as the relative positions and sizes of the planetary bodies, day and night, the seasons, phases of the moon, and eclipses.* It will be found that any teacher, with the aid of an ordinary mechanic, may produce similar apparatus, and at a small cost, and that each of the appliances, whilst it provides adequately for instruction on the subject which it illustrates, avoids the introduction of complicated details.

Along with this inspection of the series of apparatus the scholar should be encouraged to sketch on paper flat representations of what he sees. This would form an admirable introduction to the use of the astronomical diagrams found in text-books. Thus used, the apparatus forms a valuable intermediary between the actual phenomenon as it appears in nature and its representation in a diagram. It serves the purpose that the sand or plaster model of a district does to its representation by means of a map.

Relief models.—This brings me for a moment to consider the raised models used in teaching the chief features of Physical and Descriptive Geography. For class teaching the large sand model is very effective. The time taken in preparing the model on a large scale is an objection frequently urged against it. If, however, the outline of the coast and chief rivers be first chalked out on the sheet, then, by the aid of a narrow and long-funnelled water-can, the sand may easily be directed along these lines. The main mass of land area is readily covered with the sand. For representing lines of greatest elevation a few plaster casts may be prepared for permanent use.

This set of objects completes the appliances which for some years past have been in constant use by successive races of student teachers in this country, and, so far, they dispose of the charge which has sometimes been made by admirers of foreign schools who are unacquainted with those of their own country, to the effect that geographical facts are almost universally communicated to English children without the assistance of apparatus.

Field Excursions.—We have now seen the educational advantages arising from an examination of natural objects as they may be collected and arranged in a school museum. We

* A complete set of diagrams illustrative of these appliances, together with directions for their use, will be found in '*Graphic Lessons in Physical and Astronomical Geography.*'

have further recognised the necessity for apparatus of a simple yet effective kind to assist the learner in his efforts to understand phenomena which occur in nature on too grand a scale for successful direct observation. There are, however, some classes of natural phenomena which admit of being studied first hand in the field, and with greatly increased interest to those who can be introduced to them. I refer to such subjects as Botany, Geology, and Natural History generally. In briefly sketching a plan for conducting excursions for educational purposes, I shall limit my statements to one of these branches of enquiry, viz., Geology.

In arranging a Geological Excursion for an elementary class the district selected should satisfy the following conditions:—

1. *There should be a considerable variety of rock formation.*
   An elementary class, for example, will appreciate an inspection of a series of distinct formations as seen in the cretaceous system, more fully than they could a minute examination of one formation only.
2. *At the same time care should be taken that each formation is sufficiently distinct to be striking.*
   In the example quoted above, whilst there are several members of the series, each form of rock can be readily recognised.
3. *The locality selected should afford facilities for the close examination of each formation.*
   These in geology consist of quarries, cuttings, borings, &c. As an example of a district which fulfils all these conditions, the road from Caterham to a little beyond Godstone, in Surrey, may be mentioned. Within a distance of less than four miles almost the entire cretaceous series may be examined, each formation bearing very distinct rock characteristics, whilst four quarries, a cutting, a boring, and a brick-field afford sufficient opportunity for close inspection.

Preparation for the field excursion.—Besides a careful selection of the ground to be traversed, full preparation of the pupils must precede the visit. In geology this preparation would include—

1. Drawing a map of the district. This should be coloured to indicate the position of each formation.
2. Sectional diagrams to show the arrangement of the different strata upon and beneath the surface.
3. An oral lesson by the director, in which the entire field should be reviewed so far as, by the aid of maps, and diagrams, and oral explanation, this can be done in the lecture-room.

Notes of this lesson, illustrated by maps and sections, should be placed in the hands of each pupil on the morning of the excursion.

After the selection of a suitable district, and the full preparation of the class, the excursionists enter upon their inquiry under the best possible conditions for successful research. In the field the chief duty of the guide is to keep the attention of his class fixed upon the objects of pursuit. Here, again, as in the collection of objects in a school cabinet, if the attention is spread over too vast a field no distinct impressions will remain. The well-wooded park, the prettily-situated village, the cultivated field, the luxuriance of wild flower and fern—all these, whilst they repose placidly on the sense, must not, in the present case, be allowed actively to engross the mind.

Whilst special attention will thus be centred upon the objects which illustrate the previous teaching, the director will find opportunities for pointing out significant features which may have been omitted from his class-room lecture, and which, without his guidance, would escape the notice of an untrained observer, as, *e.g.*, the transition from the chalk surface to that of the gault in the excursion named above. Here no quarry is at hand to aid the pupil in his investigation, but the gault area is readily distinguished from that of the chalk by its flat weathering and its rush-covered surface.

Extension of Knowledge over districts not visited.

An important feature in geological excursions might be the attempt to reproduce on the spot, the surface appearance of districts similarly constructed, but which cannot be visited, *e.g.*, the outward extension of the chalk area in numerous ridges over the south and south-east of England may be realised by an effort of constructive imagination, which, out of materials presented to direct observation at Caterham, elaborates a view of the whole series.

The collection of specimens, the naming of fossils, the use of instruments, and, lastly, the reproduction of the knowledge gained in the pupil's own words—all these form topics which I must be content to name.

Concluding Summary.

In conclusion, let me summarise the various forms of object-teaching brought under review in this paper. These are—

(1) Objects as they may be collected for individual inspection in school cabinets.

(2) Simple apparatus, by use of which, natural phenomena occurring on a grand scale may be explained.

(3) Lastly, excursions, by means of which the learner may be brought into actual contact with things as they arrange themselves in the field.

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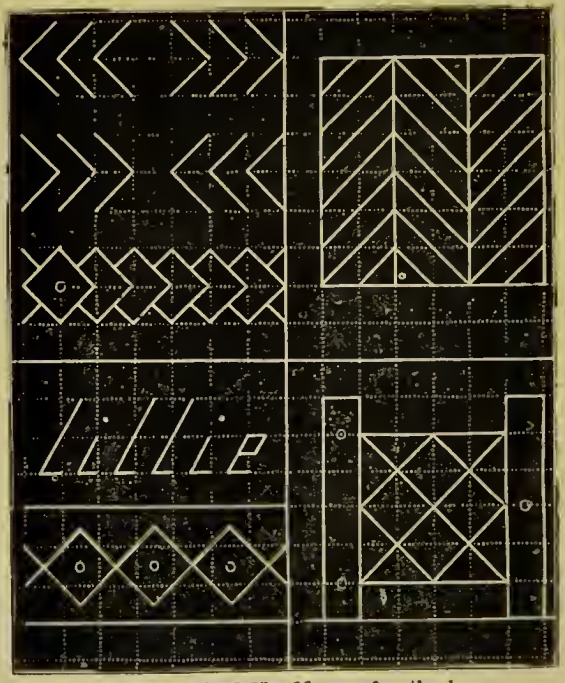

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